

0 001 510 .. - QB 24V 9PS  
Alteration to drive spindle

VDT-I-001/107 B  
Ed. 1 7.1975  
Translation of German  
edition of 19.5.1975

As from May 1975 (FD 525) QB starting motors are being supplied under the same part number but with an altered drive spindle. The part number of the spindle itself also remains unchanged:

The new drive spindles are interchangeable with the old. The 4 spring washers (pos. 72) have been replaced by a conical spring washer. The spring washer (pos. 79) between the coupling nut and the stop ring has been replaced by 4 helical compression springs and 4 straight pins in the pressure sleeve. Apart from this, the shims (pos. 74) are no longer mounted between the last steel clutch disc and the thrust ring, but rather between the clutch collar and the first steel clutch disc.

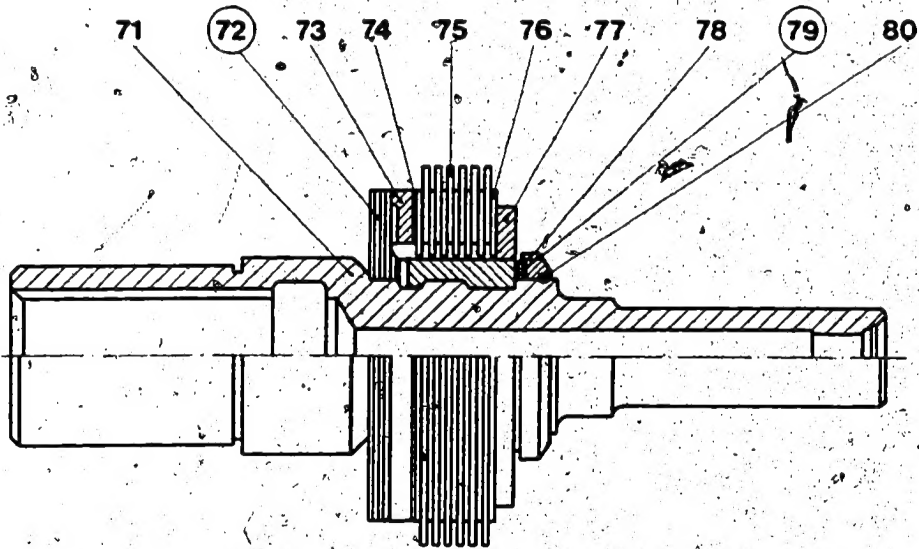


Fig. 1 old type

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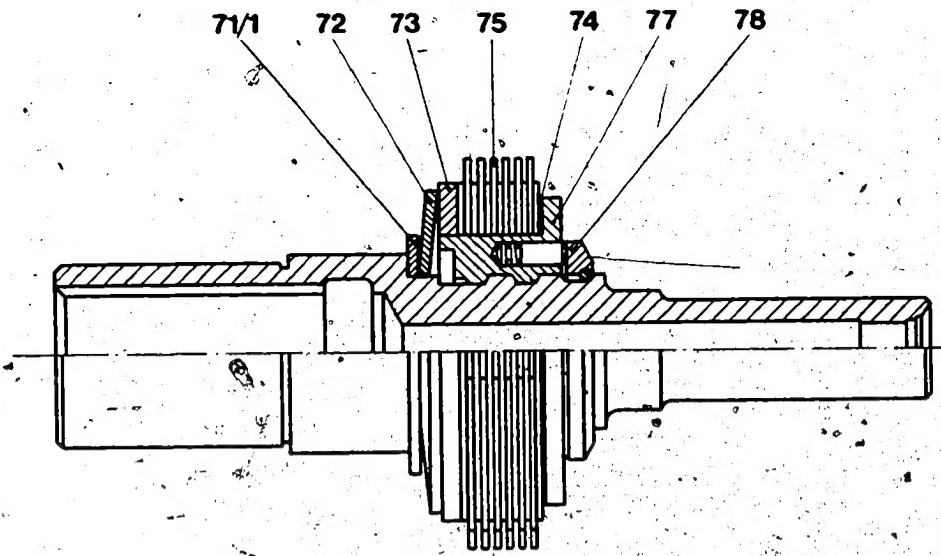


Fig. 2 new type

1. Service parts list

The following service parts for the drive spindle have been altered and have received new part numbers:

Position on diagram	Service parts designation	Part No.	Quantity
71/1	Shim	2 000 102 162	1
72	Conical spring washer	2 000 550 004	1
73	Thrust ring (3,4 mm thick)	2 000 102 007	1
74	Shim 0.35 - 0.65 mm thick	2 000 102 039	as required
		up to ...045	
75	Clutch disc	2 001 188 035	6
78	Stop ring	2 000 114 022	1

All other service parts can be taken from the list VDT-EVE 513/24 or microfiche EE-...  
 The pressure sleeve (pos. 77) is supplied under the old part number together with 4 helical compression springs and 4 straight pins.

2. Repair of old drive spindles

The installation positions of the conical spring washer (pos. 72); the helical compression springs with the straight pins, the shim (pos. 71/1) and the shims (pos. 74) can be seen from the section drawing (fig. 2).

During repair the freedom of movement of the drive spindle in the clutch housing should be checked, and if necessary any protrusions (resulting from planishing) on the driver lugs of the tombac discs must be filed down. This can only apply to the old discs 2 001 188 033.

Settings

Overload protection 200 - 240 N.m (20 - 24 mkp)

Axial clearance of pressure sleeve 0.4 - 1.2 mm

All other data should be taken from the Repair Instructions Manual VDT-WJE 513/5.

Parts set 2 007 010 044, with the pos. 71/1 - 80, is intended for the repair of old drive spindles, and for converting them to the latest design. It is obtainable through the usual channels.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH  
Geschäftsbereich K 1  
Abteilung VAK 6

**0 001 510 - QB 24 V 9 kW (9 HP)**

**00**

**Modification to multiplate clutch  
and pole-shoe mounting**

VDT-I-001/122 En  
5.1978

Archiv/VDT

The following modifications have been introduced as a feature of further development :

1. Starting with FD 821 (January 78) there is a modification in the multiplate clutch, the previous part number being retained.
2. Starting with FD 822/823 (February/March 78) there is a modification in the inside diameter of the stator frame and in the pole-shoe height, as well as in the flat-head screws (M 10 instead of M 8).

This Bulletin contains information which is to be observed during repair work.

Regarding 1. Multiplate clutch

- 1.1. The complete multiplate clutch remains unchanged in terms of installation. The following components are modified (see Figs. 1 ... 3 and the specified item numbers on the service-parts microfiche):
- 1.2. Armature shaft (Item 9/1) : The length of the disc spring seat changes from 5.5 to 4.5 mm, the seat diameter being 30.9 instead of 30.2 mm (Fig. 3). There is no change in the disc spring (Item 9/2).
- 1.3. Coupling plate (Item 9/3) : The thickness of the coupling plate is increased from 3.4 to 3.6 mm, the plate being designed as a friction plate. Consequently, one steel plate is no longer required, so only 6 steel plates must be used with the new drive spindle.
- 1.4. Shims (Item 9/4a...g) : The inside diameter of the shims is increased from 45.5 to 46 mm.
- 1.5. Coupling plates (Items 9/5 and 9/6) : The thickness of coupling plates Items 9/5 and 9/6 is increased from 1.2 to 1.45 and 1.4 mm respectively.
- 1.6. Coupling half (Item 9/7) : The coupling half is now extruded, its diameter being 46 mm (Fig. 2). There is no change in the helical compression springs (Item 9/7/3) and straight pins (Item 9/7/4).
- 1.7. Stop ring (Item 9/8) : The width of the stop ring is reduced from 4.8 to 3.8 mm.

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1.8

The shim (Item 9/9) (Technical Bulletin VDT-I-001/107) is no longer required. It is only included in parts set 2 007 010 044 and is required for repairing old and new multiplate clutches.

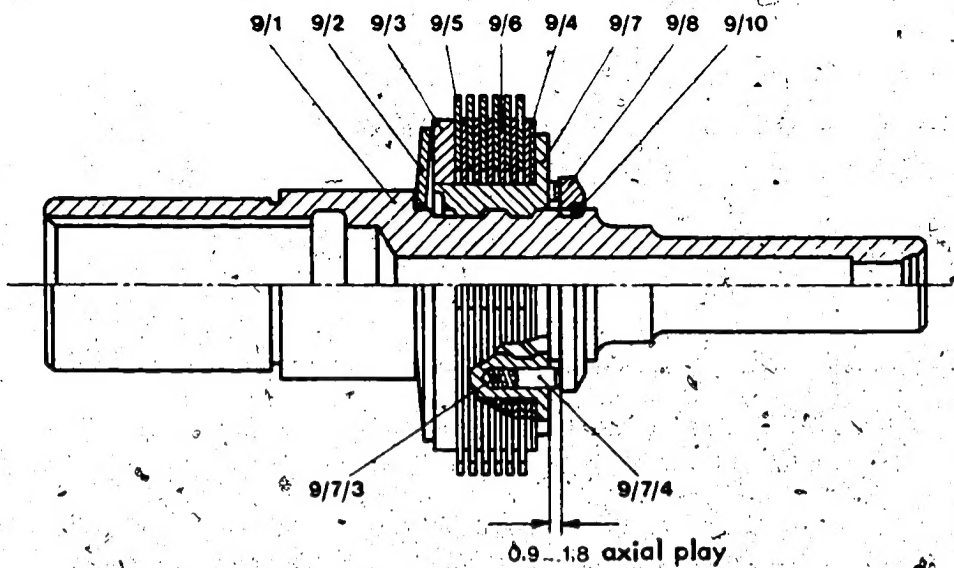


Fig. 1 Multiplate clutch

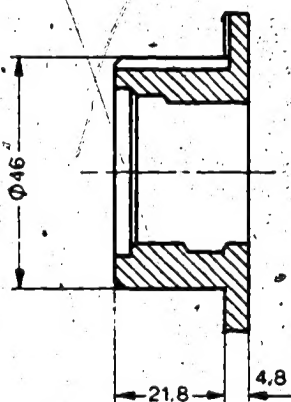


Fig. 2 Coupling half

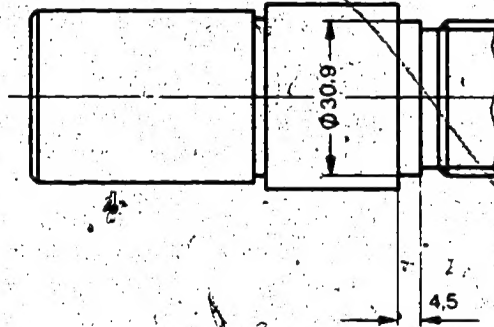


Fig. 3 Armature shaft

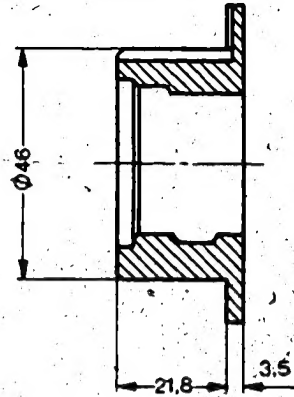
1.2

### Repair of multiplate clutch

The parts set is supplied under the previous part number 2 007 010 044 for repairs on the old and new multiplate clutches. It includes all parts, except for the armature shaft (Item 9/1).

**CAUTION!**

The coupling half (Fig. 4) of the parts set differs from the series-produced model (Fig. 2) in its dimensions. It must be used when repairing the new and old armature shafts. The shim (Item 9/9) continues to be supplied and is to be fitted in accordance with Fig. 5 or 6 when carrying out repair work.



**Fig. 4** Coupling half for parts set 2 007 010 044

Only the parts set should be used to guarantee that multiplate clutches are properly repaired. The part numbers of the individual components will not therefore be listed in future.

**List of individual components in parts set 2 007 010 044**

Item	Designation	Quantity
9/2	Disc spring	1
9/3	Coupling plate	1
9/4a...g	Shims	as required
9/5	Coupling plate (external tothing)	6
9/6	Coupling plate (internal tothing)	6
9/7	Coupling half	1
9/7/3	Helical compression spring	4
9/7/4	Straight pin	4
9/8	Stop ring	1
9/9	Shim (only in parts set)	1
9/10	Retainer	1

The shim (Item 9/9) must be fitted in accordance with Fig. 6 when carrying out repair work on the new multiplate clutches, and according to Fig. 5 (clutch chamfered) in the case of old-type clutches.

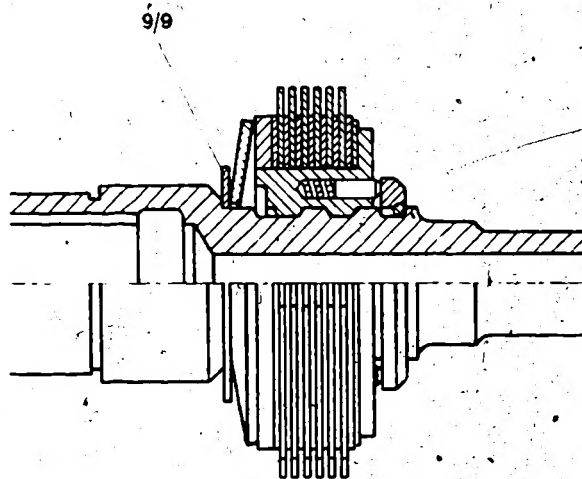


Fig. 5 Old type  
before FD 821

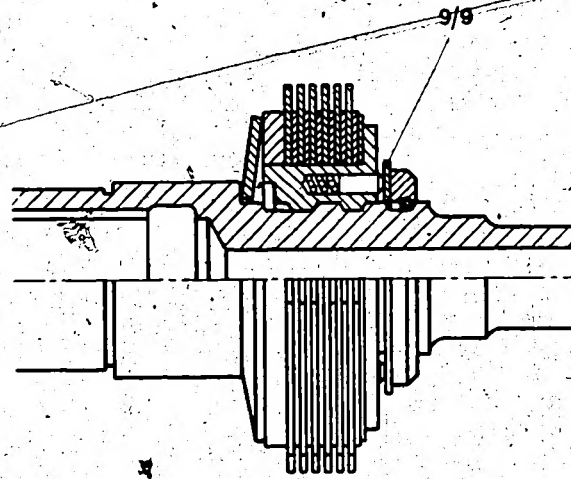


Fig. 6 New type

Settings:

Overload protection 200 ... 240 Nm (20 ... 24 kgfm)  
Axial play of coupling element 0.9 ... 1.8 mm

All other details should be taken from Repair Instructions VDT-W-001/101 B.

2. Stator frame and flat-head screws

The inside diameter of the stator frame and the pole shoe height are different as a result of the use of another production method.

Stator frame diameter 129.2 mm instead of 130 mm  
Pole-shoe height 14 mm instead of 14.4 mm

Modified stator frames can be identified by the turned pilot bore on the inside diameter for the drive end shield. There is no change in the pole bore (diameter from pole shoe to pole shoe), it is no longer corrected by turning.

The stator frames and pole shoes of the two types should not be interchanged (important for series repairs).

Otherwise, there is the danger of the starting motor not delivering the prescribed power as a result of an excessive air gap or the laminated armature core fouling the pole shoes.

More detailed information regarding replacement of the excitation windings will be found in Repair Instructions VDT-WJA 021/3.

Furthermore, M 10 flat-head screws 2 910 551 287 are used instead of the previous M 8 flat-head screws 2 910 551 240. The latter screws are still available as service parts.

VDT-BME 513/34 B

AL  
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General introduction of needle roller bearings  
in "T" starting motors from 24 V to 110 V

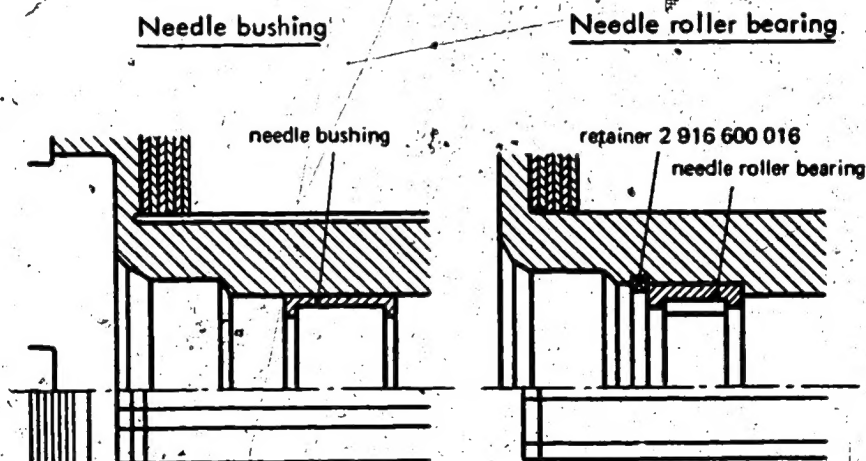
<VDT-I-001/105 B >

Edition 1.1975

Translation of German  
edition of 3.12.1974

As from FD 521 (date of manufacture January 1975), only armature types with needle roller bearing and retainer will be manufactured for "T" starting motors, the part number remaining unchanged.

The part number of the needle roller bearing is changed from 1 900 910 109 into 1 000 910 002. The needle bushing 2 000 910 003 can still be obtained through your authorized representative.



Needle roller bearing and sleeve are not interchangeable.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH  
Geschäftsbereich K 1  
Abteilung VAK 6

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A 8



**NEW ENGAGEMENT RODS,  
SECURING OF PINION ON INTERMEDIATE TRANSMISSION,  
PINNING OF INTERMEDIATE BEARING,  
on starting motors  
0 001 600 ... to 0 001 613 ... (TB, TE, TF)**

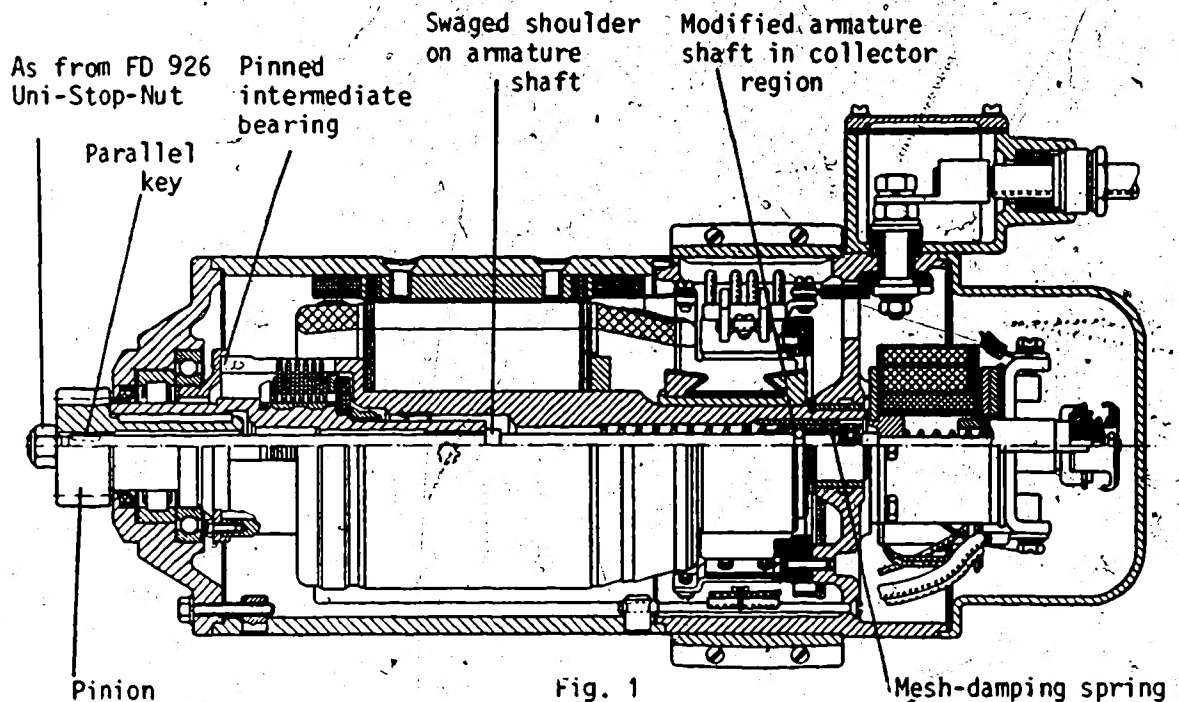
VDT-I-001/125 En  
5.1980

Engagement rod (Fig. 1)

Up to date of manufacture FD 821 (Jan. 78) the engagement rods were delivered with a locking washer, a slot in the threaded section and a pinion-securing nut (Uni-Stop-Nut). When repairing engagement rods of this type, a new locking washer (1 000 146 001) and a Uni-Stop-Nut 2 003 315 002 (M 10x1.5) or 2 003 315 000 (M 10x1) depending upon the thread in question, are to be fitted.

As from FD 822 (Feb. 78) the following modification has been carried out: The slot in the threaded portion is omitted. In its place a 3 mm wide slot was introduced for a parallel key behind the threaded section. This serves as protection against the rod turning relative to the pinion. For this purpose, the pinion was provided with a corresponding slot in its bore.

The engagement rod is now always provided with an M 10x1.5 thread.



The pinion is only secured with the Uni-Stop-Nut 2 003 315 002

The mesh-damping spring has been moved from outside the guide sleeve to inside it.

In replacement cases, only the new-type engagement rod complete as a parts set with Uni-Stop-Nut 2 003 315 002 and parallel key 1 902 300 021 is delivered.

Cross-reference between old-type and new-type engagement-rod part sets.

Engagement-rod parts set old	Engagement-rod parts set new
2 003 050 001	1 007 010 010
003	011
006	013
019	postponed temporarily
021	015
023	016
1 003 050 008	012

**IMPORTANT:** When repairing an old starting motor using a new engagement rod (modification as from FD 822) it is necessary to fit a new pinion. On the other hand new pinions (with a slot in the bore) can be used as well for the old-type engagement rods (with locking washer).

A new Uni-Stop-Nut is always to be used when carrying out repairs and tightened with a torque of 35 ... 45 N·m (3.5 ... 4.5 kgf·m).

Cross-reference between pinions.

If an old-type pinion is ordered, a new-type pinion will be delivered automatically.

Old model	New model	Old model	New model
2 006 382 030	1 006 382 130	1 006 382 002	1 006 382 102
031	131	003	103
034	134	004	104
035	135	2 006 383 030	383 130
036	136	031	131
037	137	034	134
038	138	035	135
039	139	036	136
041	141	037	137
048	148	038	138
		039	139
		042	142
		043	143

\* 10

2. Pinion fastening on starting motor 0 001 608 ...  
and 0 001 609 with intermediate transmission

In these starting motors, the locking washer underneath the fastening screw of the outer pinion is no longer fitted. Instead, the new pinion-fastening screw 2 003 450 001 has been introduced. This has a self-locking "Loc-Mel" strip (dark-colored strip on the thread). When carrying out repairs, only these screws are to be used. In cases of extreme urgency an exception may be made and the old screw-type with tab washer fitted. The locating hole for the locking washer is still located on the pinion face.

Fastening-screw tightening torque:

Old type	30...40 N·m (3...4 kgf·m)
New self-locking type	40...50 N·m (4...5 kgf·m)

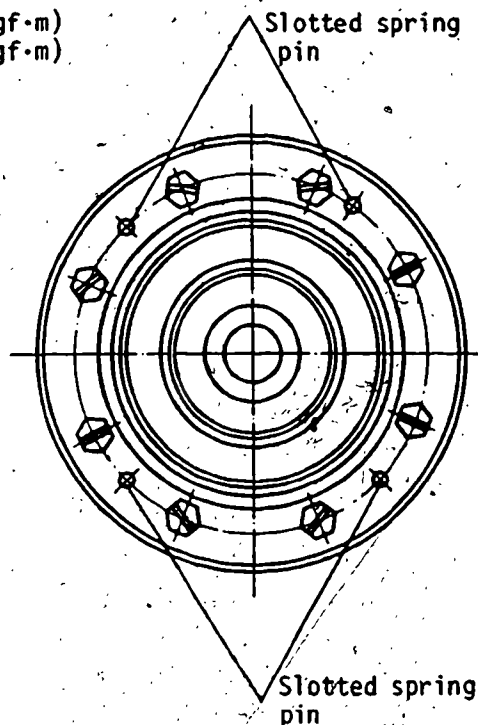
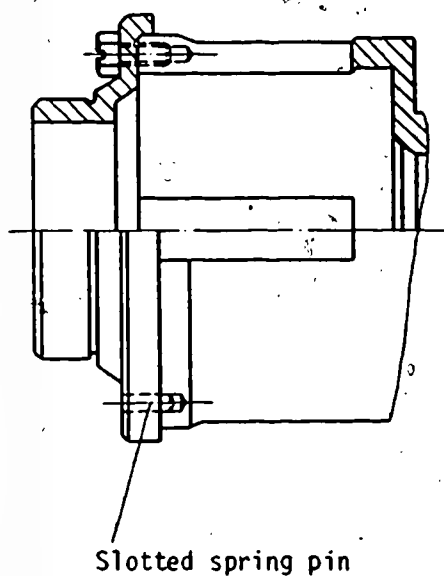


Fig. 2

3. Pinning of intermediate bearing (Fig. 2)

In several cases during starting-motor repair it has come to light that the intermediate bearing fitted to the drive housing is no longer correctly fastened.

As a remedy - only for these special cases - the intermediate bearing is also pinned with 4 slotted spring pins. These pins are included in the Service-Parts list. They are included with the intermediate bearing on new armatures.

The designation of the intermediate bearing is changed from 2 005 857 016 to 1 005 857 030.

# New fastening screws for intermediate bearings in starting motors 0 001 600 .., 0 001 612 ..

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VDT-I-001/119 B  
7. 1977

As of FD 722 (February 1977) only self-locking screws 1 003 450 009 are used in series production instead of the four tab washers 2 001 034 060 and screws 2 911 141 154 used to date. The screws can be recognized by their plastic-coated threaded section (color-painted).

New self-locking screws are to be used during all repair work, if new screws are not available, tab washers must be used with the old self-locking screws.

In the case of service part armatures use is made of cheese-head screws to secure the intermediate bearing to the drive housing for transportation purposes. These screws are to be scrapped. The self-locking hexagon screws (microencapsulated) and the tab washers are enclosed separately.

Tab washers 2 001 034 060 continue to be available individually. The tightening torque for the self-locking screws is 7 ... 8 N.m (0.7 ... 0.8 kgf.m).

A 12

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### Starter-Generators

Part number	Type (old type-designation)	Starter Part						
		Battery		No-load operation			Load setting	
		V	Ah	A	V	r/min	A	V
0 010 200 001	(LA/EE 0,15/12 + 60/12/4500 R1)	12	12	5...7,5	11...11,5	2150...2250	45	10...11
		135	-	-	-	-	-	-
0 010 300 001	G(R) 14V 11A 39; 12V 0,8 PS (LA/EG 90/12/3800 + 0,8 R1)	12	24	10...14	11...11,5	2550...2650	125	10...10,5
		135	10...14	11...12	2700...2800	145	10,5...11,5	
0 010 300 002	G(R) 14V 11A 39; 12V 0,8 PS (LA/EG 90/12/3800 + 0,8 R1)	12	18	12...16	11...12	2200...2400	100	9,5...10
		135	10...14	11...12	2700...2800	145	10,5...11,5	
0 010 300 003	G(R) 14V 11A 39; 12V 0,8 PS (LA/EG 90/12/3800 + 0,8 R1)	12	24	10...14	11...11,5	2550...2650	125	10...10,5
		135	10...14	11...12	2700...2800	145	10,5...11,5	
0 010 300 004	G(R) 14V 11A 39; 12V 0,8 PS (LA/EG 90/12/3800 + 0,8 R1)	12	24	10...14	11...11,5	2700...2800	125	10...10,5
		135	10...14	11...12	2550...2650	145	10,5...11,5	
0 010 300 006	G(R) 14V 11A 39; 12V 0,9 PS	12	24	10...15	11...12	2300...2700	150	9,5...10
		135						
0 010 350 003	J(R) 14V 20A 33; 12V 1 PS (LA/EJ 160/12/3000 + 1,0 R1)	12	24	8...10	11...11,5	2050...2150	170	9,5...10,5
		135	8...10	11...12	2050...2150	180	10,5...11,5	
0 010 350 004	J(R) 14V 11A 32; 12V 1 PS (LA/EJ 90/12/2900 + 1,0 R2)	12	24	8...10	11...11,5	2050...2150	170	9,5...10
		135	8...10	11...12	2050...2150	190	10,5...11,5	
0 010 350 005	J(R) 14V 11A 32; 12V 1 PS (LA/EJ 90/12/2900 + 1,0 R5)	12	24	8...10	11...11,5	2050...2150	170	9,5...10
		135	8...10	11...12	2050...2150	180	10,5...11,0	
0 010 350 006	J(R) 14V 20A 32; 12V 1 PS (LA/EJ 160/12/3000 + 1,0 R3)	12	24	8...10	11...11,5	2050...2150	170	9,5...10
		135	8...10	11...12	2050...2150	180	10,5...11,0	

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id	Generator Part								Clamping device
	Short-circuit		Generator voltage V	Off-load r/min	On-load		Load setting A	Brush pressure gf	
	A	V			cold r/min	warm r/min			
680...750	80...90	9...10	12	3750...3850	3950...4050	4450...4550	5	450...600 (4,5...6 N)	1) EFLJ 15/6Z 2) EFLJ 25/63 A 3) EFLJ 15/50 4) EFMM 1
680...750	250...280	8...9	12	3650...3750	3800...3900	3950...4050	7,5	850...1000 (8,5...10 N)	3)
1050...1130	320...350	9,5...10							
950...1050	180...220	7...8	12	3650...3750	3800...3900	3950...4050	7,5	850...1000 (8,5...10 N)	3)
1050...1190	320...350	9,5...10							
680...750	250...280	8...9	12	3650...3750	3800...3900	3950...4050	7,5	850...1000 (8,5...10 N)	3)
1050...1130	320...350	9,5...10							
680...750	250...280	8...9	12	3650...3750	3800...3900	3950...4050	7,5	850...1000 (8,5...10 N)	3)
1050...1130	320...350	9,5...10							
900...1150	260...300	7,5...8,5	12	3650...3750	3800...3900	3950...4050	7,5	850...1000 (8,5...10 N)	3)
600...650	290...310	7,5...8,5	12	2650...2750	2750...2850	3050...3150	13,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
700...750	345...370	9,5...10							
600...650	290...310	7,5...8,5	12	2650...2750	2750...2850	2950...3050	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
670...730	345...370	9,5...10							
600...650	290...310	7,5...8,5	12	2650...2750	2750...2850	2950...3050	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
700...730	345...390	9,5...10							
600...650	290...310	7,5...8,5	12	2650...2750	2800...2900	3050...3150	13,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50
670...730	345...390	9,5...10							

- 1) Intermediate bushing
- 2) Coupling hub
- 3) Pulley
- 4) Pinion
- 5) V-block with spindle
- 6) Drive device
- 7) Clamping flange
- 8) Shaft

Part number	Type (old type-designation)	Starter Part						
		Battery		No-load operation			Load setting	
		V	Ah	A	V	r/min	A	V
0 010 350 007	J(R) 14V 11A 32; 12V 1 PS (LA/EJ 90/12/2900+1,0 R1)	12	24	8...10	11...11,5	2050...2150	170	9,5...10
			135	8...10	11...12	2050...2150	180	10,5...11,0
0 010 350 009	J(R) 14V 20A 33; 12V 1 PS (LA/EJ 160/12/3000+1,0 R-1/45)	12	24	8...10	11...11,5	2050...2150	170	9,5...10,5
			135	8...10	11...12	2050...2150	180	10,5...11,0
0 010 350 011	J(R) 14V 20A 33; 12V 1 PS (LA/EJ 160/12/3000+1,0 R6)	12	24	8...10	11...11,5	2050...2150	170	9,5...10,5
			135	8...10	11...12	2050...2150	180	10,5...11,0
0 010 350 013	J(R) 14V 11A 32; 12V 0,9 PS (LA/EJ 90/12/2900+0,9 R7)	12	24	8...12	11...11,5	1950...2050	130	10...10,5
			135	8...12	11...12	1950...2050	160	11...11,5
0 010 350 014	J(L) 14V 11A 32; 12V 0,9 PS (LA/EJ 90/12/2900+0,9 L7)	12	24	8...12	11...11,5	1950...2050	130	10...10,5
			135	8...12	11...12	1950...2050	160	11...11,5
0 010 350 015	J(L) 14V 11A 32; 12V 1 PS (LA/EJ 90/12/2900+1,0 L5)	12	24	8...10	11...11,5	2050...2150	170	9,5...10
			135					
0 010 350 016	J(L) 14V 11A 32; 12V 1 PS	12	24	8...10	11...11,5	2050...2150	170	9,5...10
			135					
0 010 350 018	J(R) 14V 11A 32; 12V 0,9 PS	12	24	8...12	11...11,5	2050...2150	110	10...11
			135	10...15	11...12	2050...2150	160	11...11,5
0 010 350 019	J(R) 14V 11A 32; 12V 0,9 PS	12	24	10...14	11...11,5	2300...2400	130	10,0...10,5
			135	10...14	11...12	2300...2400	160	11...12
0 010 350 020	J(R) 14V 20A 33; 12V 1 PS	12	24	8...10	11...11,5	2050...2150	170	9,5...10
			135	8...10	11...12	2050...2150	180	10,5...11
0 012 500 001	Q(L) 14V 11A 19; 12V 0,4 PS (LA/DAQ 90/12/1700+0,2 L1)	12	24	6,5...7,5	11...11,5	900...1000	70	10,5...11,5
			135	6...7	11...12	800...900	70	11...12
0 012 500 002	Q(L) 14V 11A 19; 12V 0,4 PS (LA/DAQ 90/12/1700+0,2 LR2)	12	24	8...10	11...12	800...900	60	10...11,5
			135	8...10	11...12	800...900	65	11...12
0 012 500 003	Q(L) 14V 11A 19; 12V 0,4 PS (LA/DAQ 90/12/1700+0,2 L3)	12	24	6,5...7,5	11...12	900...1000	70	10,5...11,5
			135	6...7	11...12	800...900	75	11...12

			Generator Part						Clamping device
ad	Short-circuit		Generator voltage V <sub>s</sub>	Off-load r/min	On-load		Load setting A	Brush pressure gf	
	r/min	A			V	cold r/min			
300...650	290...310	7.5...8.5	12	2650...2750	2750...2850	2950...3050	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
700...750	345...390	9.5...10							
600...650	290...310	7.5...8.5	12	2650...2750	2800...2900	3050...3150	13,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
700...750	345...390	9.5...10							
600...650	290...310	7.5...8.5	12	2550...2650	2700...2750	3050...3150	13,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
700...750	345...370	9.5...10							
750...800	240...290	8...8.5	12	2900...3000	3000...3100	3250...3350	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
730...780									
750...800	240...290	8...8.5	12	2900...3000	3000...3100	3250...3350	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
730...780									
600...650	290...310	7.5...8.5	12	2650...2750	2750...2850	3050...3150	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
600...650	290...310	7.5...8.5	12	2650...2750	2750...2850	2950...3050	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
850...950	220...235	8.5...9	14	2800...2900	2900...3000	3150...3250	7,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50 4) EFMM 1
850...950	280...320	10,2							
950...1050	280...320	8.0...8.5	12	2850...2900	2900...3000	3150...3250	7,5	850...1000 (8,5...10 N)	4) EFLM 4 (A) 7) EFAZ 12/2 8) EFAZ 15
900...980	300...340	10.0...10.5							
600...650	290...310	7.5...8.5	12	2650...2750	2800...2900	3050...3150	13,5	850...1000 (8,5...10 N)	1) EFLJ 15/68 2) EFLJ 25/64 a 3) EFLJ 15/50
700...730	345...390	9.5...10							
220...300	140...150	9.5...10.5	14	1200...1300	1550...1650	1750...1850	7,5	400...500 (4...5 N)	4) EFLM 4 (A) 7) EFAZ 12/2 8) EFAZ 15
200...280	-	-							
220...300	120...130	9.5...10.5	12	1200...1300	1550...1650	1750...1850	7,5	450...500 (4,5...5 N)	4) EFLM 4 (A) 7) EFAZ 12/2 8) EFAZ 15
230...300	-	-							
220...300	140...150	9.5...10.5	12	1200...1300	1550...1650	1750...1850	7,5	450...500 (4,5...5 N)	4) EFLM 4 (A) 7) EFAZ 12/2 8) EFAZ 15
200...280	-	-							

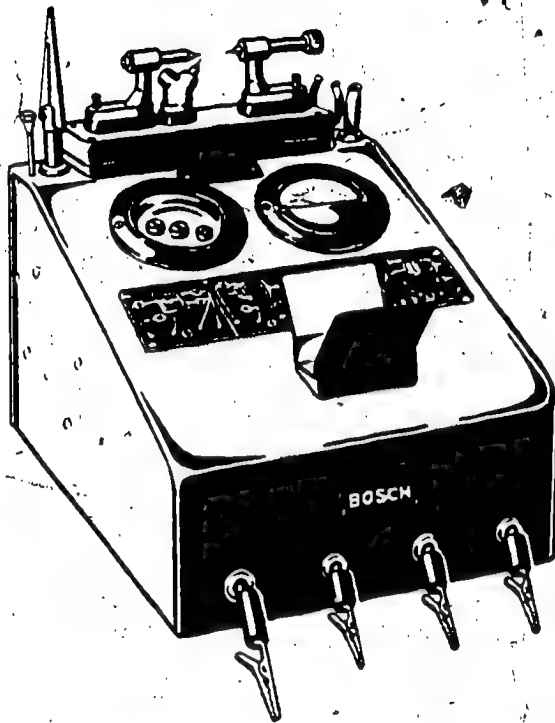
- 1) Intermediate bushing
- 2) Coupling half
- 3) Pulley
- 4) Pinion
- 5) V-block with spindle
- 6) Drive device
- 7) Clamping flange
- 8) Shaft



# BOSCH

WPE 110/2 B MZ

## TESTING INSTRUCTIONS



Instructions for  
Testing Ignition Armatures and Ignition  
Coils with Ignition Armature and  
Ignition Coil Tester

EFMZ 1

ROBERT BOSCH GMBH STUTTGART / GERMANY

## Testing Instructions

A) General

With the EFMZ I Tester ignition armatures and ignition coils of all magneto and battery ignition systems can be tested. Furthermore insulation materials can be tested for HT resistance.

The necessary test specifications: maximum primary current and spark length are given in test specification sheet WPE-110/2 - 1...4 MZ.

For the superseded tester EF 1177, resistance values were specified for testing purposes, because that tester was supplied without ammeter.

If this old Tester is to be further used, an ammeter must be connected in the circuit (e.g. EFMZ 1/25 with 0 - 4 A range). Resistance will no longer be specified for testing purposes.

B) Setting up the Tester

1. The test gap electrodes of the tester are to be set according to the instructions in WWF/111/1. Eroded electrode tips or the wrong setting of the ioniser electrode will give false results.
2. The voltage at the terminals of the tester should be 12.0 - 12.2 volts.
3. The point gap of the contact breaker is to be set as follows:
  - a) Connect new TK 12 A 3 ignition coil as if to be tested.
  - b) Adjust series resistance to 2 ohms (old testers) or set to mark (new testers).
  - c) Adjust spark electrodes to a gap of 10 mm.
  - d) Switch on tester and adjust contact breaker gap for primary current to be 1.1 A. The point gap should then be at least 0.35 mm (0.014").

### C) Maintenance of Tester

From time to time the tester must be checked and, if necessary, re-adjusted, particularly in respect of the item under B).

Oxidized, dirty and burnt breaker contacts must be cleaned with contact file EFAW 52 or replaced.

After this the tester must be re-adjusted (see B 3).

### D) Testing Instructions

#### 1. Ignition Coils & Armature

- a) Connect coil or armature as indicated in the diagrams on page 4 and adjust the electrode to the specified gap.
- b) Switch on tester and with the series resistor regulate the primary current to the specified value. Powerful sparks should now regularly jump across the test electrodes. If, even with a smaller primary current, the sparks across the gap are as they should be the coil or armature is, of course, in sound condition.

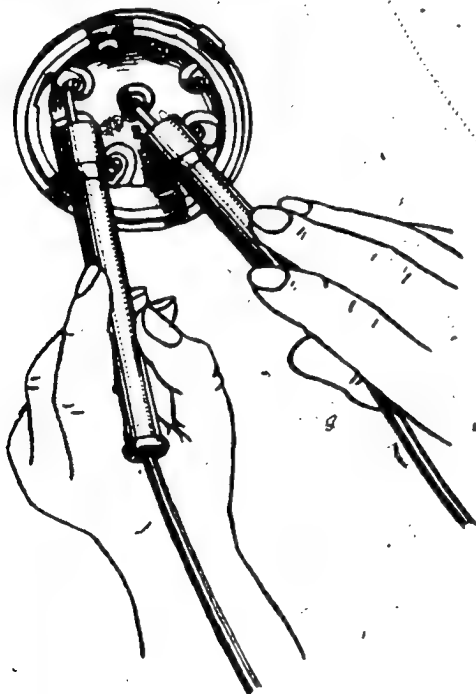


Fig. 1

Test distributor disk for puncture strength

- c) The specifications are all given for cold coils and armatures. The test therefore should not take longer than one minute, as otherwise the temperature and the resistance would increase too much (40% maximum). The primary current would decrease accordingly and would have to be re-adjusted with the series resistor.
- d) Of importance are also the following observations:  
Polarity of the tester must be correct. The armature used to complete the magnetic circuit must be provided with an insulating layer, simulating the air gap in the magnetic circuit. Attention must be paid to the notes on the test specification sheets.

## 2. Insulation (see also Fig. 1)

Connect good ignition coil (e.g. TK..) as in test. Connect the two HT cables with test probes parallel to the spark gap (to the terminals "S" and "M" or to the electrode carriers). Switch on the tester and touch the test probes to the insulation under test. For instance, hold one probe against the core end of a HT cable and move the other probe over the cable insulation. No sparks should jump across the insulation and the sparks across the gap should occur at a regular frequency. To obtain higher test voltage, simply increase the electrode gap.

## E) Explanation of Test Specifications

### 1. Spark length (mm)

Before starting the test, the test electrode gap is adjusted as specified for the particular coil or armature.

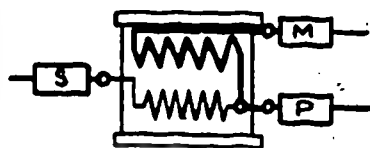
### 2. Primary Current (A)

Specified is the maximum primary current at which regular sparking should occur at the test electrodes when these have been adjusted as specified.

### 3. Primary Resistance (ohms)

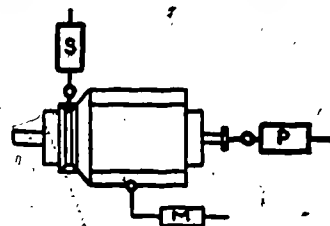
Resistance specifications enable, with certain limitations, ignition armatures and coils to be quickly tested without using the EFMZ 1 Tester. Open circuit, inter-shortening windings, series resistance and shorts to earth show up as variations from the specified values. On ignition armatures the ohm-meter is connected to the primary terminal and earth; on ignition coils to the plus and minus terminals (15 and 1).

Diagrams

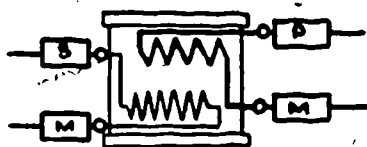


Ignition Armature

without Sliding-contact Ring

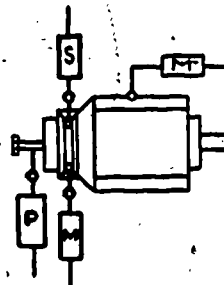


with Sliding-contact Ring

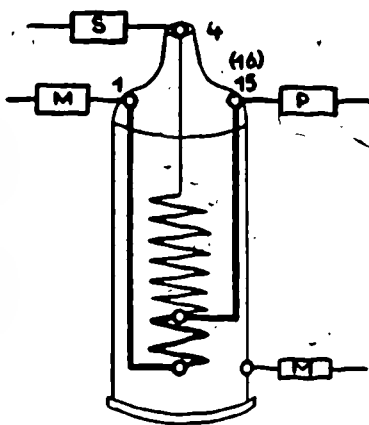


Two-spark Armature

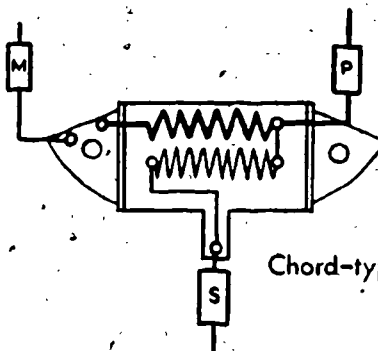
without Sliding-contact Ring



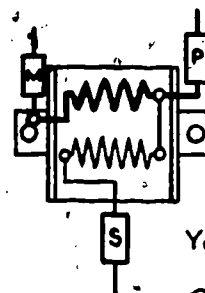
with Sliding-contact Ring



Ignition Coil



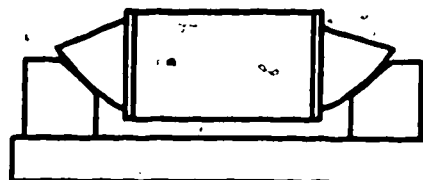
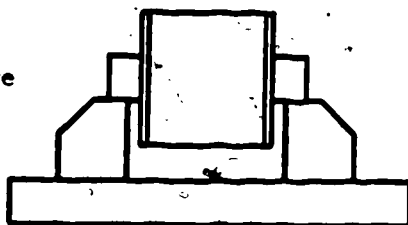
Chord-type Armature



Yoke Armature

Chord-type Armature

Yoke Armature



Application of Circuit Closer

4. Test specifications "Without Base Plate" (ohne Anker Platte)

Pertain to the testing after removal of the ignition armature or ignition coil of combined generator ignition units.

5. Test Specifications "With Base Plate & Condenser" (mit Ankerplatte und Kondensator)

These specifications pertain to armatures and coils as incorporated in the complete assemblies. Condenser and contact breaker are connected, but the points must be kept open e.g. by placing a piece of cardboard between them.

In generator ignition units incorporating two coils, (for 2 cyl. engines) the primary cable of one coil must be unsoldered from the joint connection to terminal 15.

6. Specifications "With Magnetic Circuit closed" (mit Schlußstück)

These specifications pertain to ignition armatures tested with closed magnetic circuit (circuit closer EFMZ 4). The same spark length is obtained with smaller primary current or a longer spark is obtained with the same current. (see diagram on page 4)

7. Specification "With Sliding-Contact Ring" (mit Schleifring)

These specifications pertain to the testing of rotary armatures with sliding contact ring.

8. Specifications "Without Sliding-Contact Ring" (ohne Schleifring)

These specifications pertain to the testing of rotary armatures without sliding contact.

9. Test Specifications for Ignition Coils

Ignition coils with separate series resistor (terminal 16 instead of 15) are tested without this resistor.

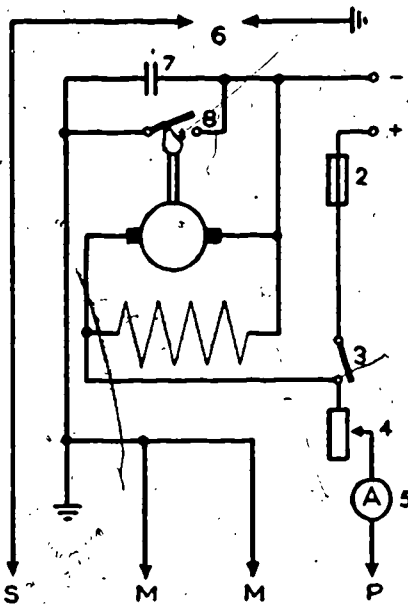
10. Winding or Armature Identification.

The winding (coil) numbers are printed on the insulation of the ignition armature coils.

The armature number is printed on one of the two insulation end plates of the coil as the abbreviated type formula.

Example: coil end plate marked 3 Z 16  
type formula MZAN 3 Z 16 Z

## Diagrams



G) Spare Parts for EFMZ 1  
(see diagram)

1	Terminal	EF 209
2	Cut out element with fuse	EF 192/1 EF 260/4
3	Pull-push switch	SH/TZ 1/5 Z
4	Adjusting knob	EFMZ 1/7 B/2
5	Ammeter	EFMZ 1/25
6	Spark gap	EF 1177/7
7	Capacitor	ZKO 29/13 Z
8	Fixed contact	ZKT 48/5 Z
	Contact-breaker lever	ZUH 9/6 Z or /4 Z

# BOSCH

REPAIR INSTRUCTIONS

**21**

VDT-WJE 214/2 B

Ed. 1

## Breakerless Magneto Magneto Generators with Trigger Box

**RCPK**

A-24



### Contents

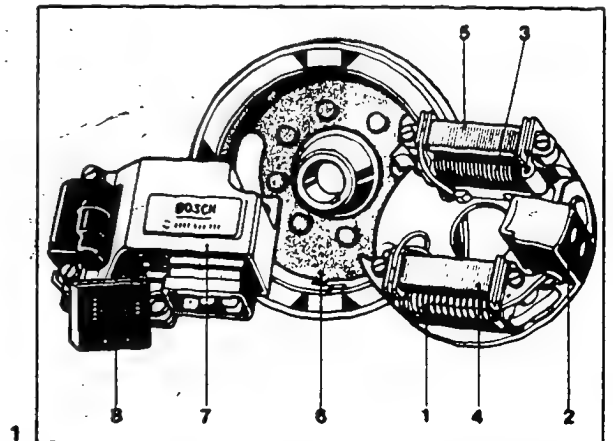
Page	
3	1. Test equipment and tools
3	2. Construction of equipment
4	3. Trouble-shooting chart
7	4. Repair instructions
7	5. Ignition timing

## 1. Test equipment and tools

Puller	(formerly EFLM 14)	KDLM 6798
or	(formerly EFLM 11)	KDLM 6797
Ohmmeter with 1.5 V terminal voltage		Commercially available
Feeler gauge, 0.3 mm		Commercially available
Timing light	All types except	EFAW 169
Chronometric revolution counter, e.g.	EF 3292	1 687 233 005
or		
Photoelectric revolution counter, e.g.	EFAW 257	0 681 500 800
Ignition coil and capacitor tester	EFAW 106 A	0 681 100 001
Loading resistor	EF 1289	1 684 509 000
Voltmeter for direct and alternating voltage, range 0 - 15V		Commercially available

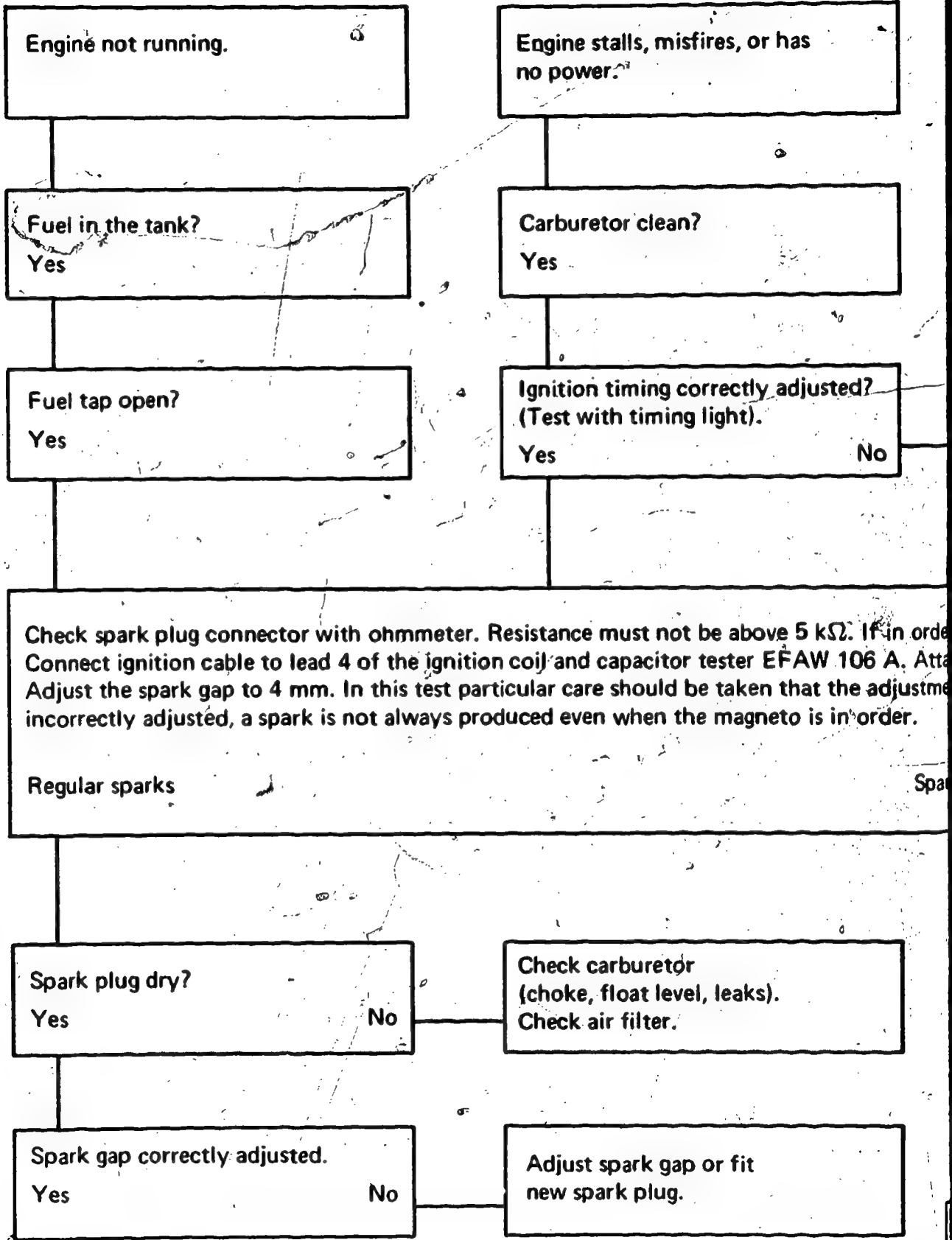
## 2. Construction of equipment

- 1 Charging armature
- 2 Pick-up
- 3 Generator armature (headlight)
- 4 Generator armature (stop light)
- 5 Generator armature (tail light)
- 6 Flywheel
- 7 Trigger box
- 8 Connecting plug



### 3. Trouble-shooting chart

#### 3.1. Ignition part



A26

Engine not running  
on all cylinders.

Adjust ignition timing  
(see text and Figs. 9 and 10)

In order, unscrew spark plug.  
Attach black clip of tester to engine ground.  
(Adjustment of the spark tester is as specified<sup>1</sup>). If

Sparks absent or only intermittent

Disconnect shorting switch.  
Repeat test.

Sparks absent  
or only  
intermittent.

Normal  
sparks

A27

Fuel line not blocked?  
Carburetor clean?  
Ignition timing correctly adjusted?

Try replacing trigger box.  
Spark jumps absent or  
only intermittent

In order

With ohmmeter check resistance of charging armature (Fig. 2)<sup>3</sup> and  
compare with specification value VDT-WPE 213/. . B.  
Value deviates In order

Fit  
Ch  
lig  
(se

Fit new charging armature. Set air gap to 0.25 to 0.40 mm.  
(see Fig. 8)

Test pick-up  
Resistance v  
terminal vol  
In order

Check leads between magneto and shorting switch and  
also trigger box.  
In order Not in order

Repair leads

Try replacing charging armature.

Check flywheel for damage. Replace if magnets loose or broken or riveting not firm. If flywheel  
be damaged, examine crankshaft bearing. Tighten flywheel (tightening torque as given by e  
Set air gap to 0.25 to 0.40 mm (Fig. 5).

Adjust ignition timing with  
timing light.

### 3.2. Generator part

Lighting not working or dim.  
(Bulbs are in order).

A 28  
5

er

Replace shorting switch.

new trigger box.  
check ignition timing with timing  
light and readjust if necessary  
(see Fig. 10).

up winding with ohmmeter (Fig. 3)<sup>3</sup>.  
value when using an ohmmeter with 1.5 V  
voltage; 50 to 80 ohms<sup>2</sup>).  
Value deviates

ds.

Replace armature base plate.

lywheel found to  
(by engine manufacturer).

Battery does not charge.

Terminal arrangement  
Figs. 2 und 3 applies only  
to size R

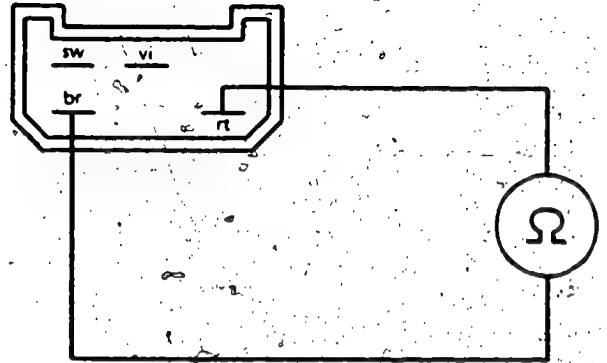


Fig. 2

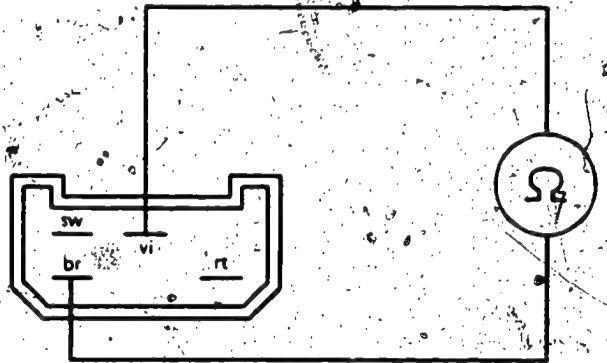


Fig. 3

WSE 24412

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Separate cables of generator armature from the rest of the electrical system and connect Part No. J 684 509 000 and ordinary a.c. voltmeter with a range of 0 to 15 V (Fig. 4). Bring the engine up to the speed given in the test specifications VDT-WPE 213/. . B.

Voltage is attained

Find out if system is equipped with rectifiers (Fig. 5).

Yes

No

Remove flywheel and examine for magnets and check that riveting of flywheel is in order, replace generator if riveting is not in order (gap 0.40 mm).

Check rectifiers with ohmmeter.

The terminal arrangement is as shown in Fig. 5. Test diodes individually. Test in both directions. The reading must be under  $150 \Omega$  in one direction and over  $150 \Omega$  in the other. If the alternator tester EFAW 192 is available then check the diodes with it (test the same as exciter diodes).

Not in order

In order

If present, check rectifier fuses.

In order

Not in order

Replace rectifiers.

Replace fuses. Examine cables for damage.

<sup>1</sup>) See operating instructions WA-UBF 105/7 B (previously VDT-UBF 105/7 B).

<sup>2</sup>) Measure in both directions. The value must be attained on at least one measurement. Note! Do not use an ohmmeter with higher terminal voltage.

<sup>3</sup>) If there is no brown cable, measure to engine ground.

connect to resistor EF 1289,

4)

Voltage is not attained

mine for broken or in some other way damaged  
wiring is firm. Replace damaged flywheels. If  
generator armature. Set air gap (0.25 to

Check cables of the whole system  
for contact resistance and open  
circuit. Examine bulbs and light  
switch.

bles for short circuits.

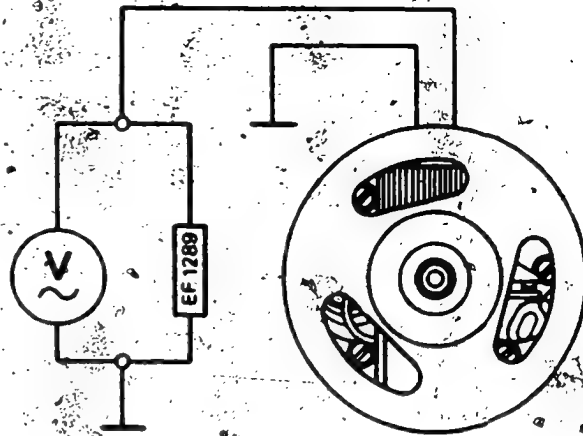


Fig. 4

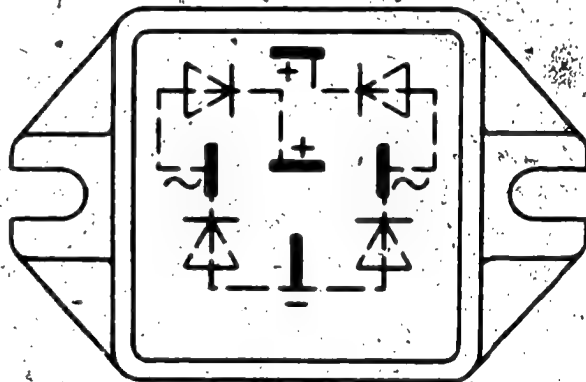
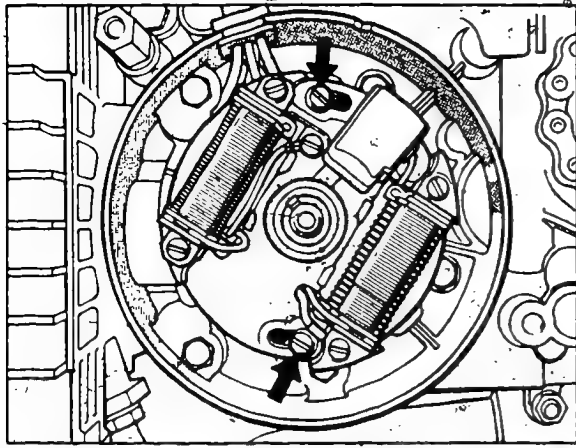


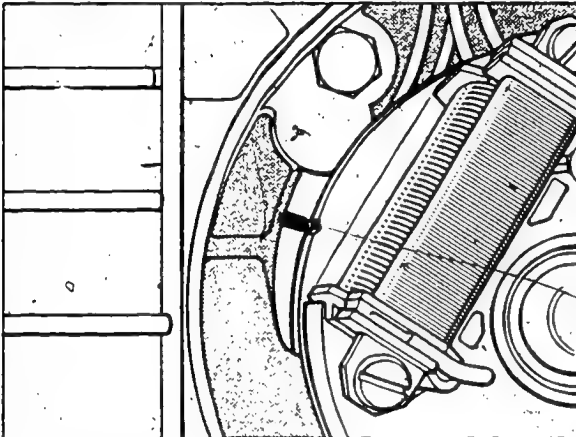
Fig. 5



## 4. Repair instructions

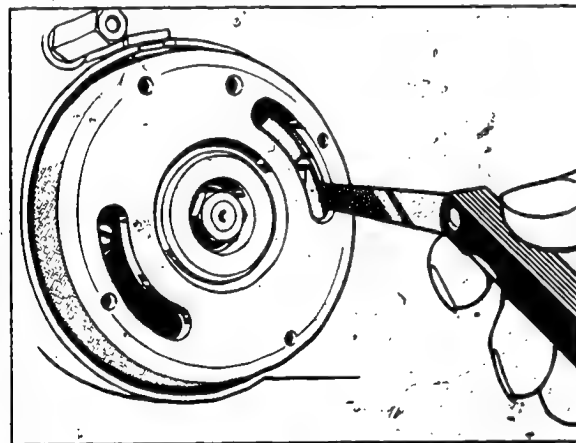
When removing the flywheel, it should be noted that the thread on the crankshaft may be left-handed.

To replace an armature or the entire armature base plate, the fastening screws of the armature base plate (arrows) should first be removed and the armature base plate withdrawn.

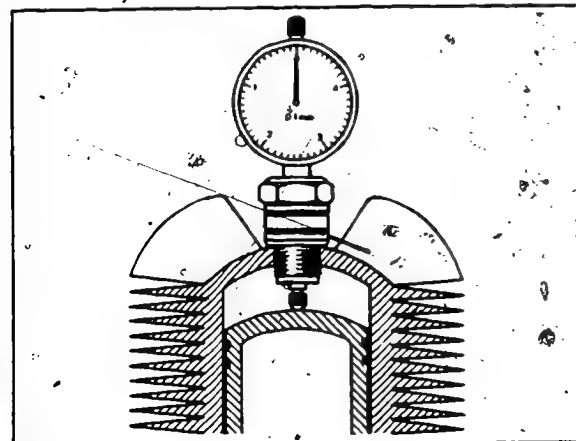


When installing the armature base plate, the mark on the armature base plate must be aligned with that on the engine casing (Fig. 7).

If there is no mark on the armature base plate, or the trigger box, flywheel or armature base plate were replaced, the ignition timing must be re-adjusted with the timing light (see Figs. 9 and 10).



When one of the armatures has been replaced or its screws loosened, the air gap must be set. This is achieved by slackening the screws of the pole shoe and inserting the 0.3 mm feeler gauge between the pole shoe and the oxide magnet (Fig. 8). Press on the pole shoe and firmly tighten the fastening screw. Measure at each pole separately and make the necessary adjustments.



## 5. Ignition timing

If the timing marks cannot be recognised when the engine is installed, the engine piston should be put at the ignition point with the aid of a suitable measuring instrument (Fig. 9) (observe the engine manufacturer's instructions). Make a mark on the engine casing and a corresponding one on the flywheel or fan.



Start the engine and with the timing light flash the timing marks. The two marks must coincide at 7000 rev/min.

Measure the speed at the crankshaft with the chronometric revolution counter or at the flywheel with the photoelectric revolution counter. If a photoelectric revolution counter is used, a light-coloured timing mark must be made on a suitable position on the flywheel. There are to be no other marks or holes at the same distance from the hub as the timing mark, because they will cause false readings.

If the two marks do not coincide, stop the engine and turn the armature base plate appropriately. Repeat the adjustment until the marks exactly coincide.

If the armature base plate, flywheel or trigger box were replaced, remove the flywheel after the ignition timing adjustment and transfer the marking on the engine casing to the armature base plate, erasing at the same time the old marking thereon.

- 1 = Battery connection cable. Red clip on positive.
- 2 = Battery connection cable. Black clip on negative.

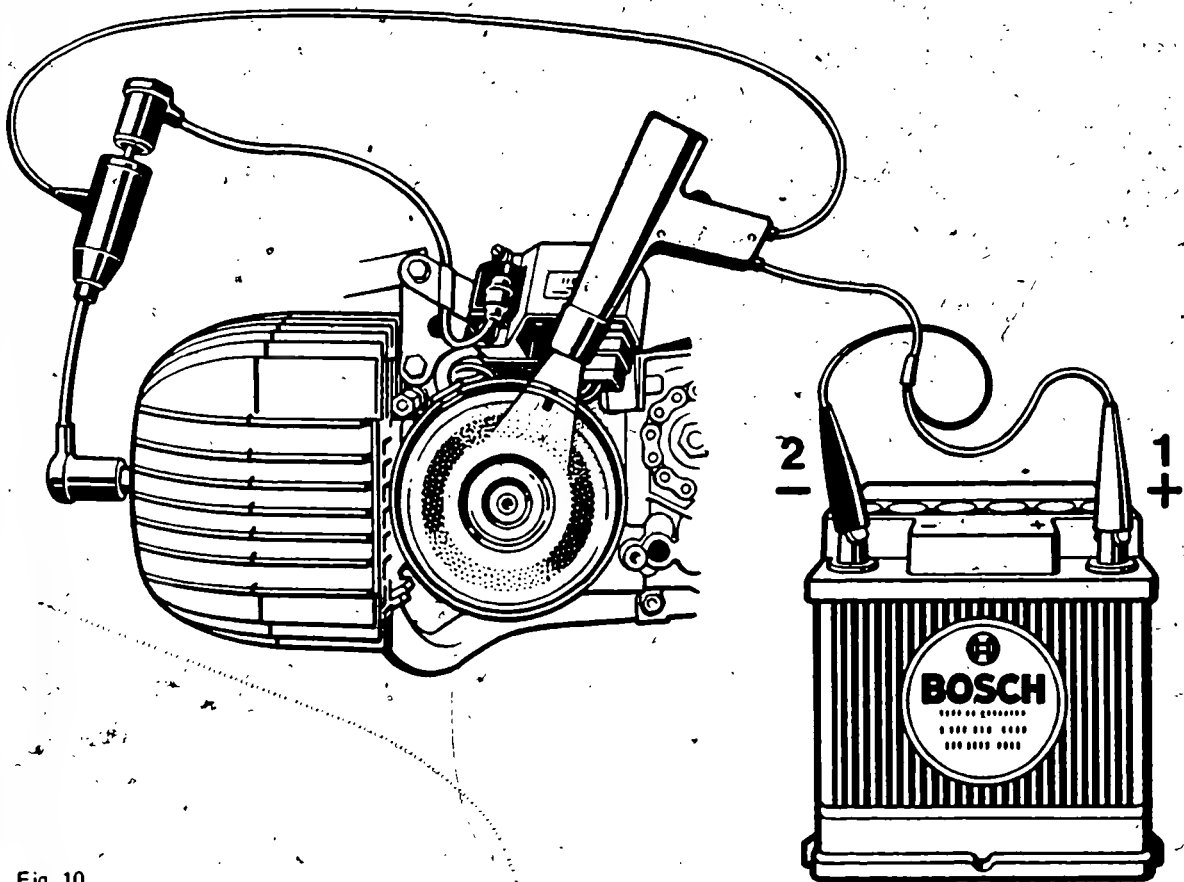


Fig. 10

# BOSCH

TEST INSTRUCTIONS

**21**

VDT-WPE 213/101 B

Ed. 1

## Magnetos and Magneto-generators

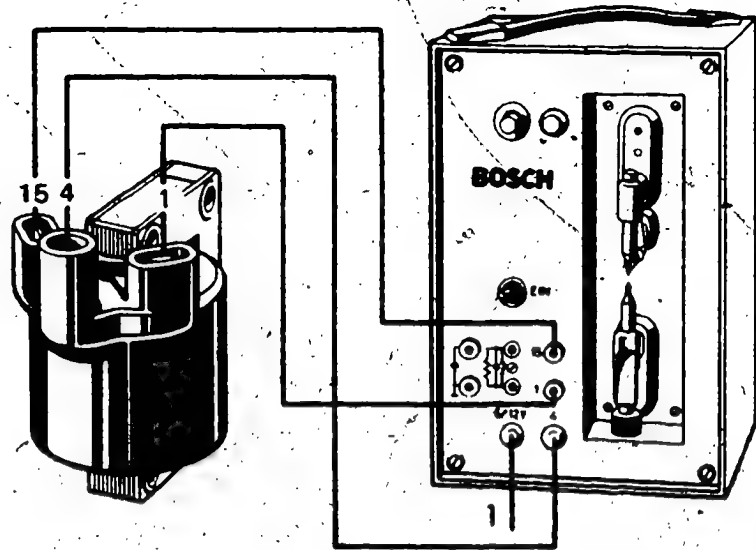


Fig. 1

Cable 1 = Battery

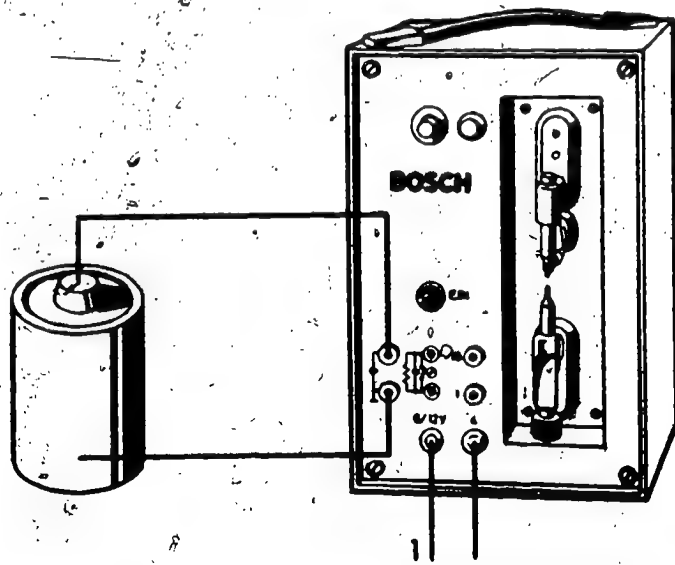


Fig. 3

87  
27  
870

Test circuits

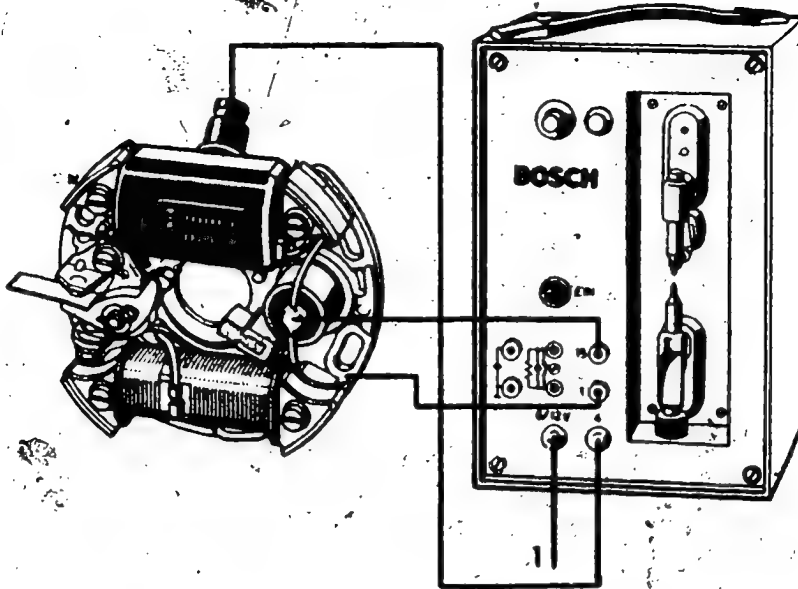


Fig. 2

Battery connection

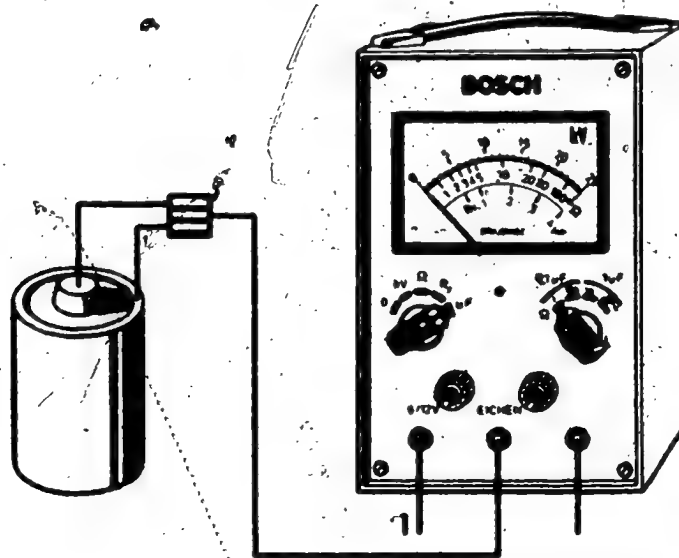


Fig. 4

38  
35  
571

# Breaker triggered magnet

Igniti

Engine not running.

Engine stalls  
no power.

Fuel in the tank?  
Yes

Carburetor c

Fuel valve open?  
Yes

Ignition point  
adjusted?  
Yes

Test spark plug connector with ohmmeter. If in order, unscrew spark plug. Connect ignition coil to spark plug. Attach black clip of tester to engine ground. Set spark gap of tester to 6 mm for magnetos. On multi-cylinder engines carry out test on each cylinder. Caution: Adjustment of spark gap unit\* must be correct, otherwise flashovers will be non-normal. Turn over the engine.

Normal flashovers

Spark plug dry?  
Yes No

Check carburetor (choke, float level, leaks).  
Check air filter.

Electrode gap correctly  
adjusted?  
Yes No

Adjust electrode gap or use new spark plug.

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# Magnetos and magneto-generators

Ignition part

...talls or has  
...r.

Engine not running  
on all cylinders.

...or clean?  
Yes

...point correctly  
No

Adjust ignition point.

...ignition cable to cable 4 of the ignition coil and capacitor tester EFAW 106 A.  
...magneto sizes T and S, to 5 mm for size R magnetos and to 4 mm for sizes P, K and E.  
...out the test separately for each cylinder.  
...non-existent or only intermittent even if the magneto is sound.  
...engine with starting device.

No flashovers or only intermittent

Disconnect shorting switch. Check short circuiting line.  
If in order, repeat test with disconnected shorting switch.

210

No flashovers or only intermittent      Normal flashovers

WSE 2131 101

Fuel line not blocked?  
Carburetor clean?  
Ignition point correctly adjusted?

Exam  
In-order  
(clean, not  
too burnt)

On systems with external ignition coil  
Test ignition coil with tester EFAW 106 A. Connect tester to 12 V battery<sup>1</sup>). Connect coil terminals to the corresponding receptacles on the tester (Fig. 1). Set spark gap to 6 mm. Switch on tester.

Spark length is  
not attained

Normal  
flashovers

Test ignition armature  
to armature base plate  
material between the  
of the ignition armature  
is not attained, contact  
reached, the ignition

Spark length is attained

Test capacitor with  
tester 105 A\*\* (F  
Capacitor defective

Replace ignition coil.

Replace capacitor

Fit on flywheel armature  
Set air gap to 0.2

- \* See operating instructions VDT-UBF 105/7 B.
- \*\* See operating instructions VDT-UBF 105/9 B.
- <sup>1</sup>) Earlier magnetos may be fitted with 6 V coil.  
Take note of type marking. For 6 V ignition coils  
connect tester to 6 V. Ignition coils 0 212 940 001/ .. 002  
and 0 221 500 800/ .. 801 are 12 V coils.

Adjust ignition point

3/11  
37  
RHS

Replace shorting switch.

Examine distributor contact points.

Badly burnt, contaminated, oil fouled, rubbing block worn; contact opening too small or too large; contact pressure too low.

Adjust distributor contact points or replace. Adjust ignition point.

On systems with ignition armature  
in armature with tester EFAW 106 A. First connect the tester to 6 V battery. Connect terminal 1  
base plate and terminal 15 to the capacitor terminal. Clamp a small piece of insulating  
between the distributor contact points. Connect cable 4 of the tester to the high tension terminal  
ignition armature (Fig. 2). Switch on tester. The spark length must reach at least 2 to 3 mm. If this  
is not attained, connect the tester to 12 V. The spark length must now be at least 6 mm. If this length is  
attained, the ignition armature is in order. Test no longer than 1 minute.

Spark length is attained

Spark length is not attained

Capacitor with tester EFAW 106 A\* (Fig. 3) or with ignition  
tester A\*\* (Fig. 4).

Capacitor defective

Capacitor sound

Capacitor.

Replace ignition armature.

Check flywheel for damage. If magnets are loose or broken or the riveting is not firm, replace the flywheel. If flywheel is damaged, check the crankshaft bearing.

flywheel and tighten. (Tightening torque as given by engine manufacturer).  
gap to 0.25 to 0.35 mm (Fig. 5).

Ignition point.

WIE 2314M

812



# Breakerless magnetos and

Ignition

Engine not running.

Fuel in the tank?  
Yes

Fuel valve open?  
Yes

Engine stalls or has

Carburetor clean?  
Yes

Ignition point correct  
(Test with stroboscope)  
Yes

Check spark plug connector with ohmmeter. If in order, unscrew spark plug. Connect ignition tester to spark plug. Attach black clip of tester to engine ground. Adjust the spark gap of the tester to 6 mm for 1/4 inch. **Caution:** Adjustment of spark gap unit must be correct, otherwise flashovers will be non-effective. Turn over the engine very slowly. On multi-cylinder engines carry out the test on each cylinder.

Normal flashovers

Spark plug dry?  
Yes

Check carburetor (choke, float level, leaks).  
Check air filter.

Electrode gap correctly adjusted?  
Yes

Adjust electrode gap or use new spark plug.

Fuel line not blocked? Carburetor clean? Ignition point correctly adjusted?

313  
38  
344

# ed magneto-generators

tion part

has no power.

Engine not running  
on all cylinders.

Correctly adjusted?  
(scopical timing light)  
No

Adjust ignition point.

Ignition cable to cable 4 of the ignition coil and capacitor tester EFAW 106 A.  
for size S magnetos and to 4 mm for magneto sizes K, R and E.  
Non-existent or only intermittent even if the magneto is sound.  
Use with starting device.  
Do the test separately for each cylinder.

No flashovers or only intermittent

All magnetos (except  
size E with cast-in storage  
capacitor):  
Disconnect shorting switch.  
Repeat test.

No flashovers or  
only intermittent

Size E magnetos with cast-in storage  
capacitor:  
Disconnect shorting switch.  
Connect the free terminal on the  
magneto to ground. Repeat test.

Normal  
flashovers

Replace shorting switch.

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WSE 213104

**Size S magnetos**  
 Test ignition coil with tester EFAW 106 A. Connect tester to 12 V battery.  
 Connect coil terminals to the corresponding receptacles (Fig. 1). Set spark gap to 6 mm.  
 Switch on tester.

Normal flashovers  
 Spark length is not reached

**Size R and K magnetos**  
 Measure resistance of ignition armature primary winding with ohmmeter and compare with test specification.

In order  
 Value deviates

Change ignition coil.

Measure capacitance of storage capacitor with ignition tester EFAW 105 A\*\* (Fig. 4).

Value deviates  
 In order

Replace ignition coil. Fit on flywheel. Adjust air gap to 0.25 to 0.35 mm. Adjust ignition points with stroboscopic timing light.

Try changing control unit.

In order  
 No spark

Replace storage capacitor as well as armature base plate.

Try changing firing order, then ignition points.

Install new control unit.

Test charging armature with ohmmeter (Fig. 6).

Resistance value deviates  
 In order

Check flywheel. Set ignition points.

Fit new charging armature. Adjust air gap to 0.25 to 0.35 mm (Fig. 5).

Test trigger winding. Compare resistance with test specification.

In order

Test capacitance of storage capacitor with ignition tester EFAW 105 A\*\*.

In order  
 Value deviates

Replace storage capacitor.

Try replacing charging armature.

Check flywheel. Replace the flywheel (tightening torque).

Adjust ignition points with stroboscopic timing light.

\* See operating instructions VDT-UBF 105/7 B.

\*\* See operating instructions VDT-UBF 105/9 B.

1) See test specifications VDT-WPE 116/211 B.

magnetos  
ce of ignition  
y winding  
and compare  
cation.

Value deviates

ignition armature.  
y/wheel. Set air gap  
to 0.35 mm (Fig. 5).  
gnition point with  
opic timing light.

nging first the control  
n ignition armature.

ywheel. Set air gap to 0.25 to 0.35 mm (Fig. 5).  
tion point with stroboscopic timing light.

nger winding with ohmmeter (Fig. 7).  
e resistance with test specifications.

Value deviates

e storage capacitor as well as armature base plate.

flywheel for damage. If magnets are loose or broken or the riveting is not firm,  
the flywheel. If flywheel is damaged, check the crankshaft bearing. Tighten flywheel  
ning torque as given by engine manufacturer). Set air gap to 0.25 to 0.35 mm (Fig. 5).

gnition point with  
copic timing light.

Size E magnetos

External storage capacitor:  
Shorting switch disconnected or in  
position "Engine on". Remove  
connection to capacitor from magneto  
and test storage capacitor with  
ignition tester ÉFAW 105 A\*\* (Fig. 4).

In order

Value deviates

With storage capacitor cast in  
the magneto housing:  
Check plug connections. If in  
order, replace magneto. Set air  
gap (0.25 to 0.35 mm).

Install new magneto. Air gap  
0.25 to 0.35 mm (Fig. 5).  
Adjust ignition point with  
stroboscopic timing light.

Fit new storage capacitor.

Test the charging armature with ohmmeter (Fig. 6).  
On magnetos with charging diode (circuit diagram 5<sup>1</sup>) measure  
resistance of winding as well as diode. Reverse cables of ohmmeter  
and measure again. The resistance measured last must be at  
least 10 times greater or smaller than the first value.

In order

Not in order

Replace charging armature.

Replace complete  
armature base plate.

W3E 21310M

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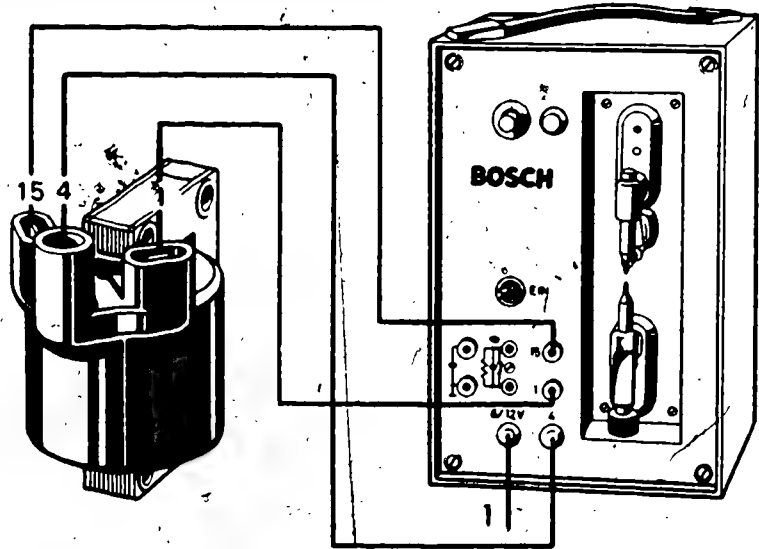


Fig. 1

Cable 1 = Battery

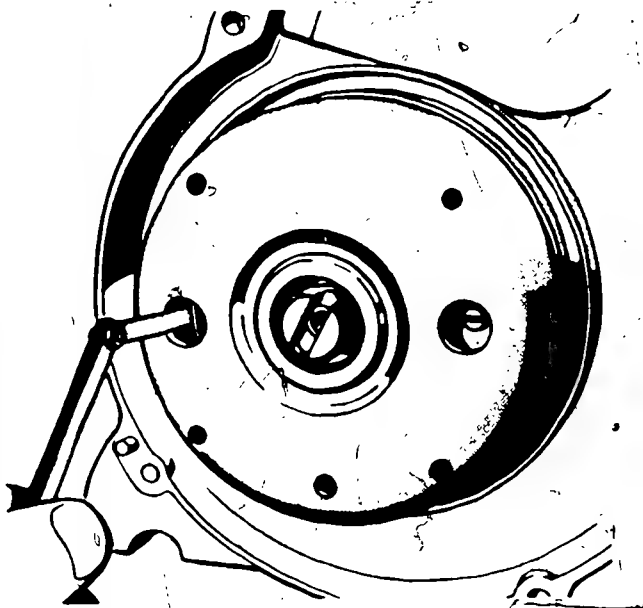


Fig. 5

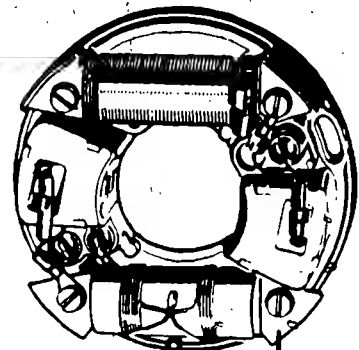


Fig. 6

↓ 17  
240

5/16

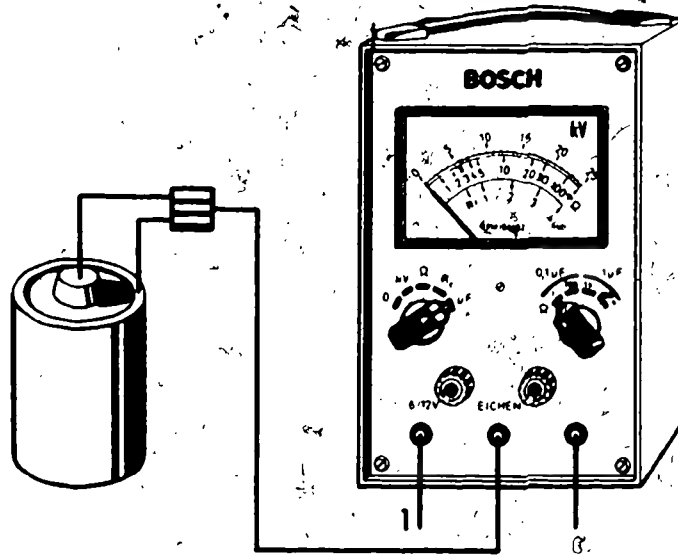


Fig. 4

Battery connection

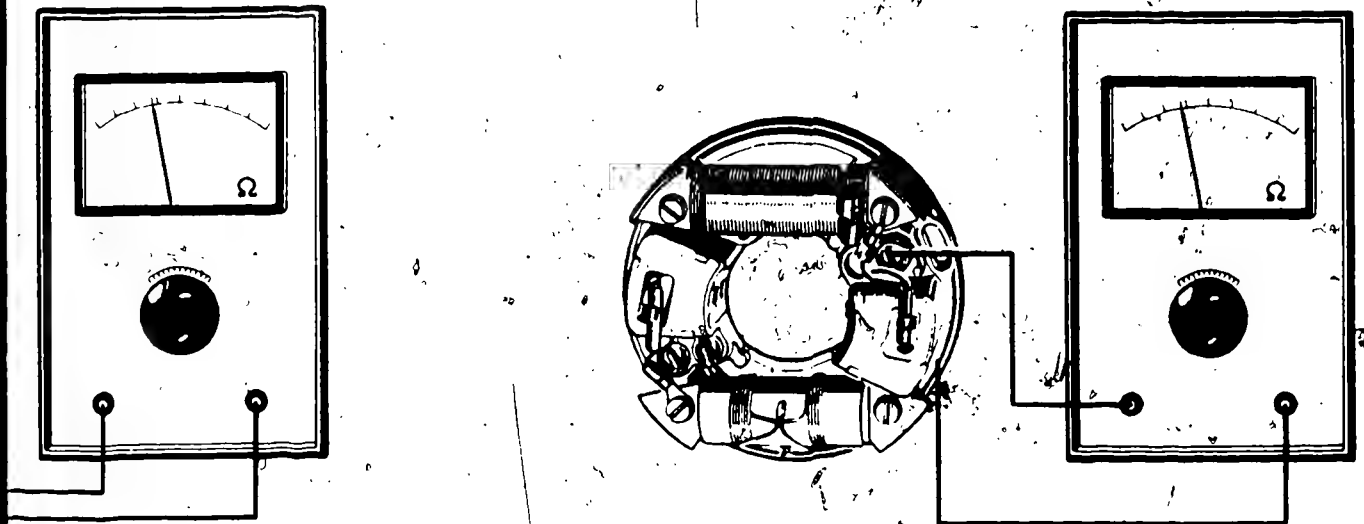
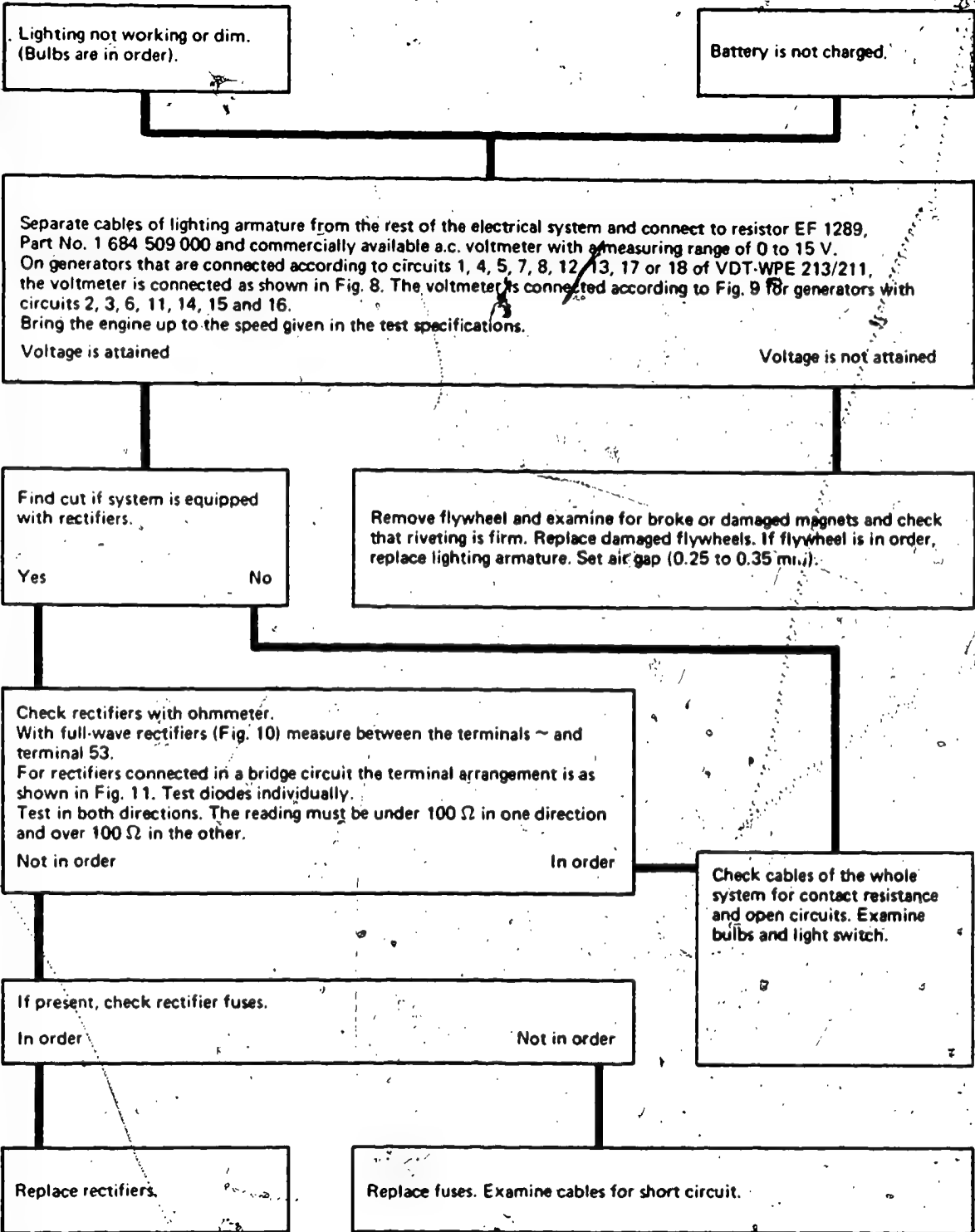


Fig. 7

WSE 24310M

8/18  
JW  
JH

Generator part



Lighting not working or dim.  
(Bulbs are in order).

Battery is not charged.

Separate cables of lighting armature from the rest of the electrical system and connect to resistor EF 1289, Part No. 1 684 509 000 and commercially available a.c. voltmeter with a measuring range of 0 to 15 V. On generators that are connected according to circuits 1, 4, 5, 7, 8, 12, 13, 17 or 18 of VDT-WPE 213/211, the voltmeter is connected as shown in Fig. 8. The voltmeter is connected according to Fig. 9 for generators with circuits 2, 3, 6, 11, 14, 15 and 16. Bring the engine up to the speed given in the test specifications.

Voltage is attained

Voltage is not attained

Find cut if system is equipped with rectifiers.

Yes

No

Remove flywheel and examine for broke or damaged magnets and check that riveting is firm. Replace damaged flywheels. If flywheel is in order, replace lighting armature. Set air gap (0.25 to 0.35 mm.)

Check rectifiers with ohmmeter. With full-wave rectifiers (Fig. 10) measure between the terminals ~ and terminal 53. For rectifiers connected in a bridge circuit the terminal arrangement is as shown in Fig. 11. Test diodes individually. Test in both directions. The reading must be under 100 Ω in one direction and over 100 Ω in the other.

Not in order

In order

Check cables of the whole system for contact resistance and open circuits. Examine bulbs and light switch.

If present, check rectifier fuses.

In order

Not in order

Replace rectifiers.

Replace fuses. Examine cables for short circuit.

Test circuits

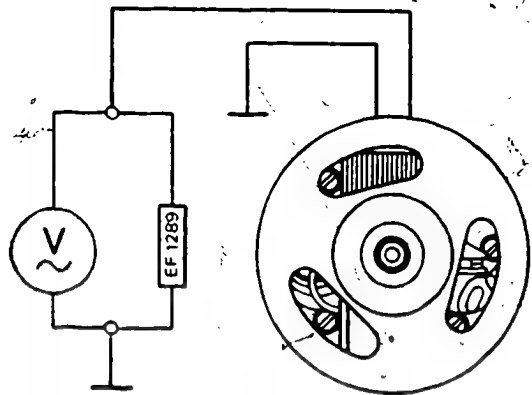


Fig. 8

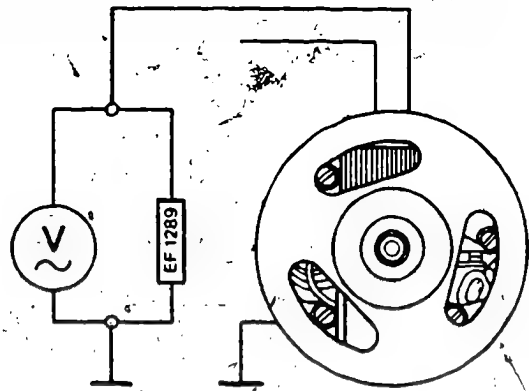


Fig. 9

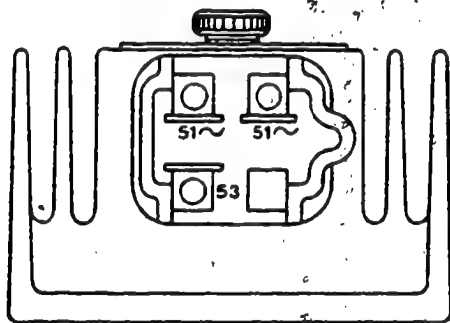


Fig. 10

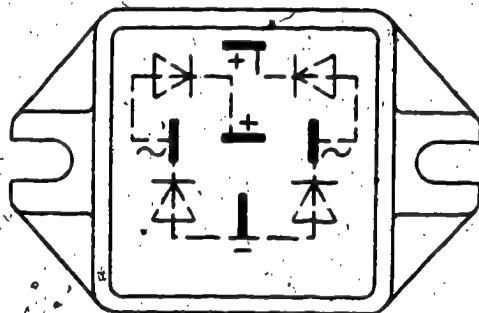


Fig. 11



# BOSCH

GERMANY

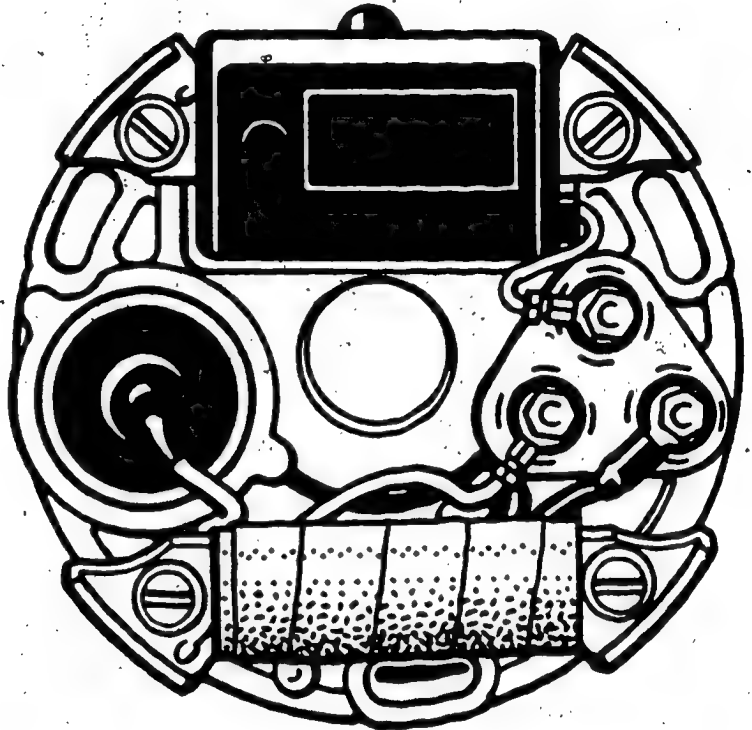
REPAIR INSTRUCTIONS  
INSTRUCTIONS DE RÉPARATION  
INSTRUCCIONES DE REPARACIÓN

Archiv VDT

20

VDT-WJE 114/2 B

Ed. 1



## Breakerless Magneto Magnétos sans contacts Magneto sin contactos

KBK 0204099..

RBK 0204199..

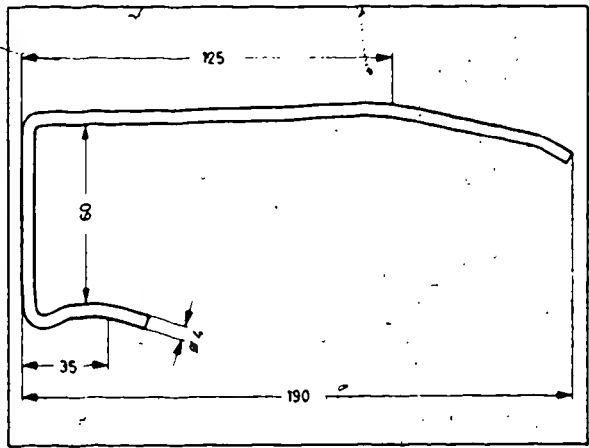
# 1. Necessary testing equipment, tools and insulating material

## 1.1 Equipment and tools for testing in the installed state

Puller	EFLM 14 or EFLM 11	0 681 321 003 0 681 321 002
Ohmmeter	for e.g., TΩ 1000 or Pontavi	commercial commercial
Stroboscopic timing light*	all models except EFAW 169	
Hand tachometer	e.g. EF 3292	1 687 233 005
Feeler gauge, 0.3 mm		commercial

## 1.2 Auxiliary equipment for testing on the generator-test bench EFLJ 20 ... or 25 ... or a suitable support

Spark gap	EF-1177/7	0 684 530 000
Mounting and driving device	EFLM 4 A	0 681 221 002
Clamping set for clamping ignition unit Type KBK consisting of drive shaft EFLM 29/2 and intermediate plate EFLM 29/1	EFLM 29	1 685 722 005
Clamping flange and drive shaft for clamping of ignition unit Type RBK	EFLJ 16 EFLM 35	1 688 120 026 1 683 052 022
Supporting clip for control unit	(Fig. 1)	home-made
Straight-edge marker		home-made

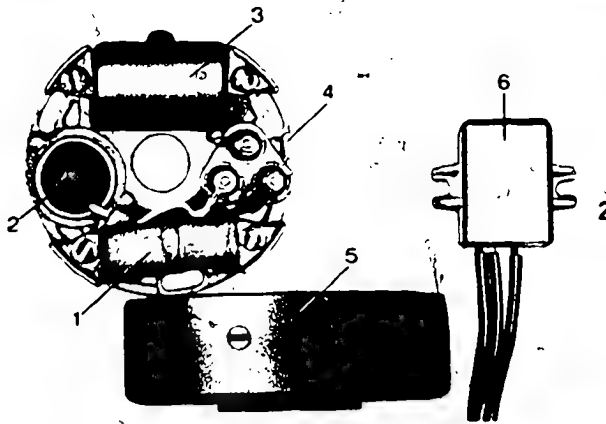


## 1.3 Insulating material

Silicone rubber	e.g., Elastosil 07	commercial
-----------------	--------------------	------------

\* Ignition armature or control unit may only be replaced if a stroboscopic timing light is available (stroboscope light), because the firing point may change upon replacement of these parts.

If no timing light is available, only the complete magneto, flywheel, charging armature or capacitor including armature base plate may be replaced.



## 2. Construction of the equipment

1. Charging armature
2. Capacitor
3. Ignition armature
4. Armature base plate
5. Flywheel
6. Control unit



## 3. Testing of installed equipment

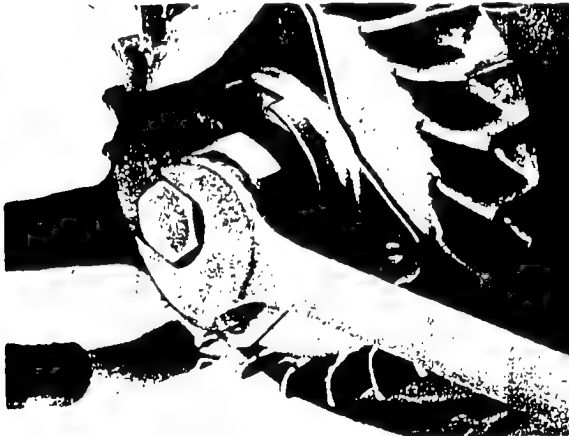
Remove plug terminal and push ignition cable on a spark plug in good condition.

Place plug on engine ground, firmly pull out hand starter.

- 3 If no regular sparking occurs, unbolt housing cover and fan housing with hand starter.

Disconnect black lead on the kill button and insulate. If necessary, reinstall fan housing with hand starter. Repeat test.

If regular sparking occurs now, replace shorting switch and reconnect line.



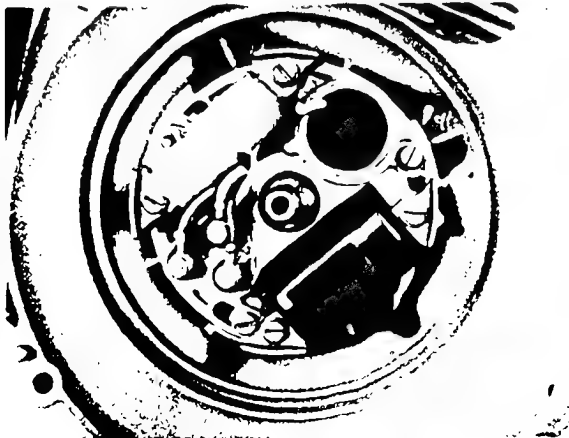
## 4. Removal and reinstallation. Testing of individual components

- 4 If the preceding test resulted in an irregular spark or none, at all in spite of the insulated short circuiting line, the equipment is removed as follows:

Remove hand starter.

Disconnect oil lines, if present.

Hold flywheel with a suitable device. Loosen retaining nut of the flywheel. Remove flywheel with a puller.



### 4.1 Visual inspection

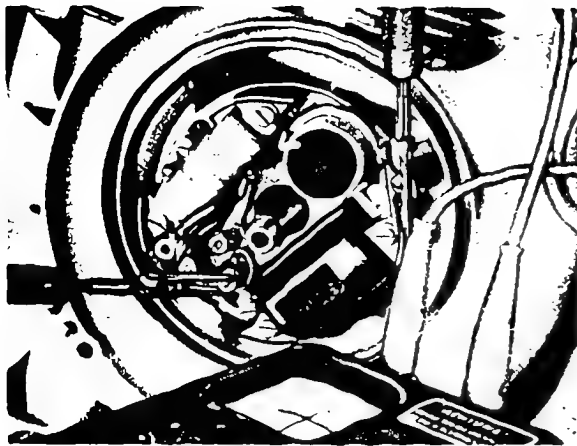
Inspect flywheel for acceptable condition of the oxide magnets and tight seat of the hub.

- 5 Discharge capacitor by shorting.

Dry components of the ignition system or clean with brush soaked in cleaning fluid and blow out well.

Caution: do not use other cleaning agents.

Check armature base plate with installed components for damage.



#### 4.2 Ignition armature

Disconnect lines from the fastening points.

Check windings of the ignition armature with ohmmeter:

Primary winding between low-tension connection and ground.

Resistance value  $1 \Omega$  max.

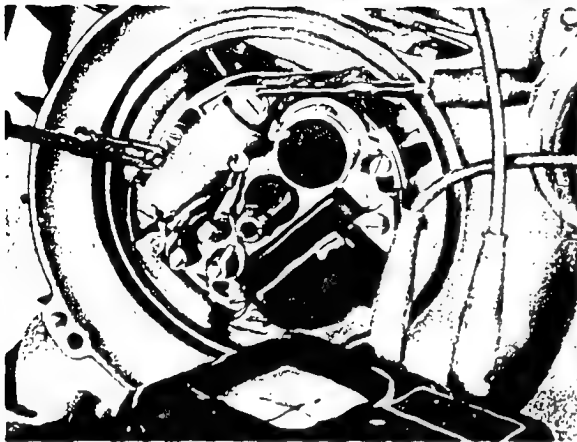
Secondary winding between high-tension connection and ground.

Resistance value 1 to 3 k $\Omega$

If resistance is  $\infty$  check connection between ignition cable and spark plug terminal.

If measured values deviate, replace ignition armature.

Firing point must then be readjusted.



#### 4.3 Charging armature

Check charging armature with ohmmeter with disconnected leads.

Measure resistance of the winding including diode. Reconnect leads of the ohmmeter and repeat measurement. The last resistance value measured must be at least ten times greater or smaller than the first.

For ignition unit 0 204 199 001 (charging diode in control unit).

Resistance value 0.5 to 1.6 k $\Omega$

If the measured values differ, replace the charging armature.

For replacement of the charging armature of ignition unit 0 204 199 001 unsolder soldered lead on charging armature with soldering iron or soldering gun (150 W max.).

#### 4.4 Capacitor

Capacitance test with Tester EFAW-105 A

Connect test clips of test lead to disconnected capacitor lead and ground.

Function selector switch to  $\mu\text{F}$ .

Measuring range switch to 1  $\mu\text{F}$ .

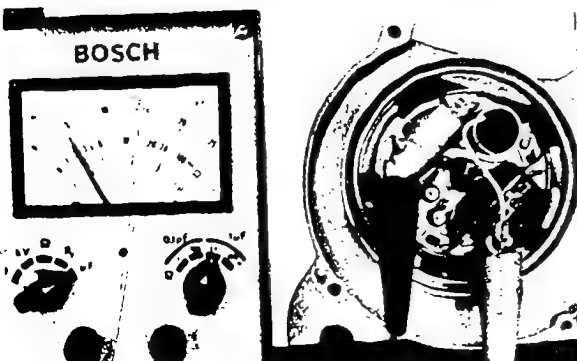
Capacitance value 0.6 to 0.9  $\mu\text{F}$

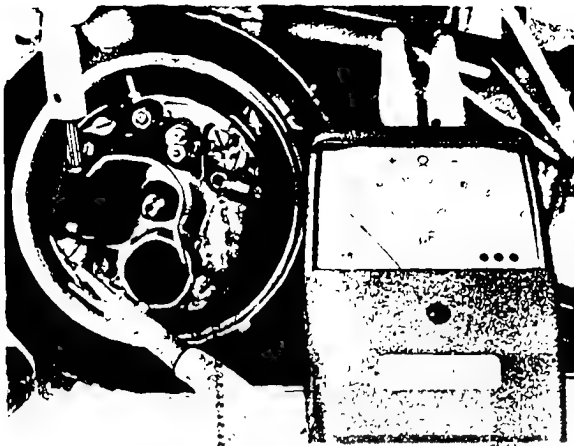
If the measured value deviates, replace capacitor with armature base plate.

Instructions for marking

If no timing light is available, the armature base plate mark must be transferred to the new armature base plate as follows:

Unbolt ignition armature, place old armature base plate on a piece of paper, accurately mark slots and armature base plate mark. Remove old armature base plate, align new armature base plate so that slots are again in the same position. Transfer mark to new armature base plate and punch in.

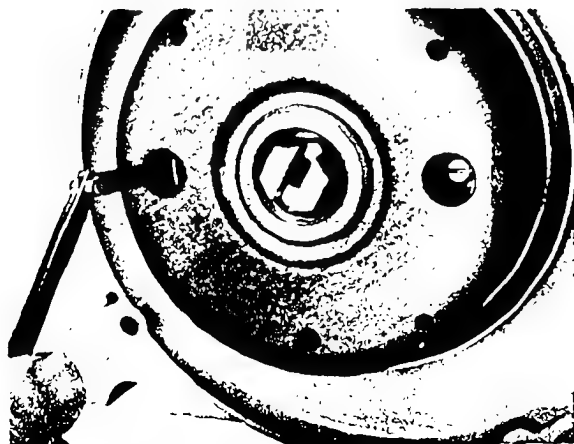




9



10



11

Capacitor check with ohmmeter TΩ 1000

Discharge capacitor, connect test leads to disconnected lead of the capacitor and ground.

Pointer must briefly deflect.

If pointer does not move or if the deflection remains constant, replace capacitor with armature base plate.

#### 4.5 Control unit

If no defect was found in the preceding checks of the components, try to replace the control unit first and then the ignition armature with parts of the same order number.

Take care to have a good ground connection of the control unit housing (fastening screws).

Readjust firing point.

#### Installation hint:

If necessary, disconnect throttle linkage and remove carburetor.

In the installation of the carburetor, care should be taken to keep dirt out of the intake manifold. The gasket may not be damaged and the contact surfaces must be clean.

Caution: Do not bend throttle linkage.

### 5. Air gap adjustment

Remove fan from flywheel. Replace flywheel and tighten bolts.

Tightening torque 3.0 + 0.5 kgf.m

#### Caution

Control unit should not make contact with the hub.

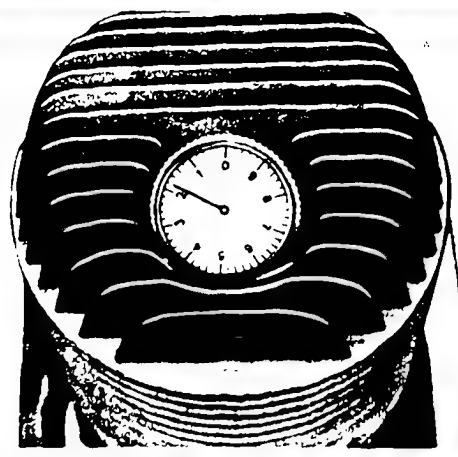
Adjust air gap with feeler gauge.

Gap 0.25 to 0.39 mm

Insert feeler gauge between pole shoe and oxide magnet. Loosen fastening screw. Force down pole shoe and tighten fastening screw well.

Gauge and adjust each pole separately.

# 6. Ignition timing adjustment on the engine



## 6.1 With stroboscopic timing light

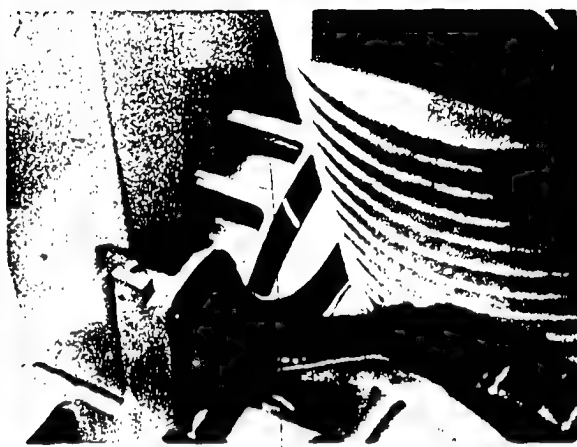
12 If a timing light is available, all components can be replaced individually.

Place piston in firing position. Use suitable measuring device. (Note instructions of engine manufacturer).

Place a mark at a suitable point on engine housing and a matching point on the fan. This mark must be visible from the outside in the completely assembled engine.

Start engine, flash marks with stroboscopic timing light. Both marks must coincide at 6000 rev/min.

Figs. 13 and 14



13 Measure the speed on the drive end of the crankshaft with hand tachometer.

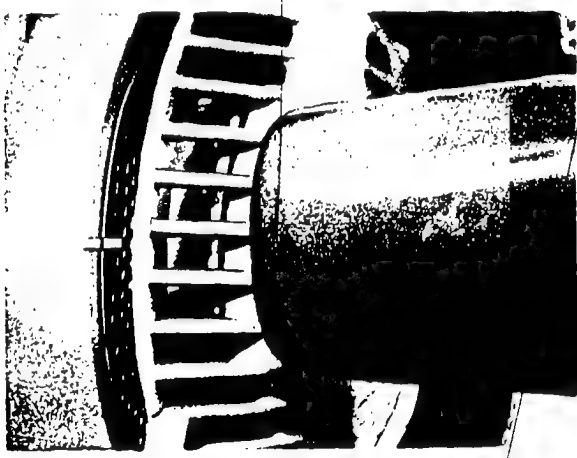
If the marks do not coincide, correct as follows: Stop engine, slightly loosen fastening screws of the armature base plate, rotate the latter suitably and tighten again.

Start engine again, check firing point at 6000 rev/min with stroboscopic timing light.

Figs. 13 and 14

Repeat adjustments until the marks coincide exactly.

Remove flywheel, insulate terminal clips with silicone rubber and with a suitable tool transfer engine housing mark to the armature base plate so that the marks match.



14



15

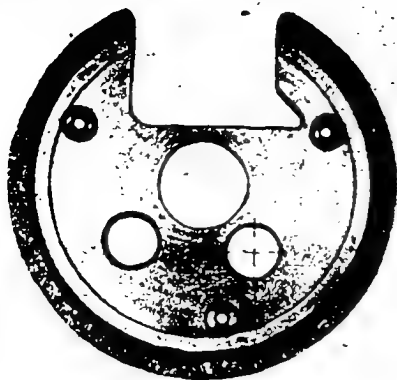
## 6.2 Without stroboscopic timing light

If no timing light is available, accurately transfer the armature base plate mark to the face of the armature base plate and with a suitable tool align with the engine housing mark (see arrows).

Tighten armature base plate, reinstall flywheel, adjust air gap (see Par. 5).

## 7. Testing the equipment

on generator test bench EFLJ 20  
or EFLJ 25.. or suitable support

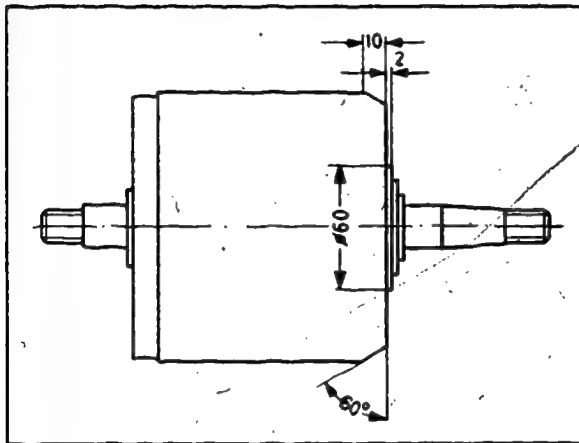


### 16 7.1 Preparation of the mounting and driving device EFLM 4 A.

Drill a 15 mm diameter hole through intermediate plate  
EFLM 29/1 for cable feed. Fig. 16

Turn a 60° chamfer and a 2 mm shoulder of 60 mm  
diameter (see sketch) on the bearing bushing of the  
mounting and driving device EFLM 4 A.

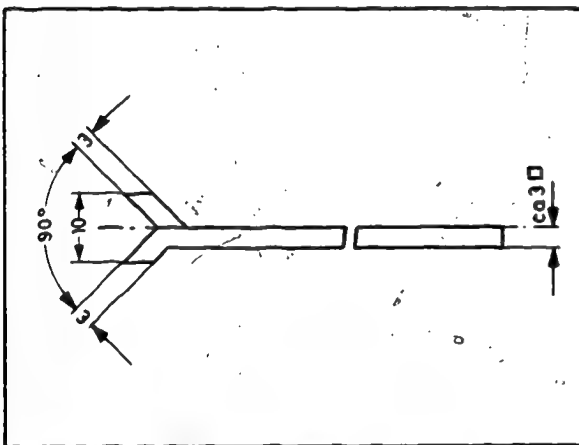
Chamfer the edges well.



17

Fabricate a straight-edge marker (see sketch).

Mount spark gap EF 1177/7 on test bench and connect  
ground test prod with test bench ground.



18



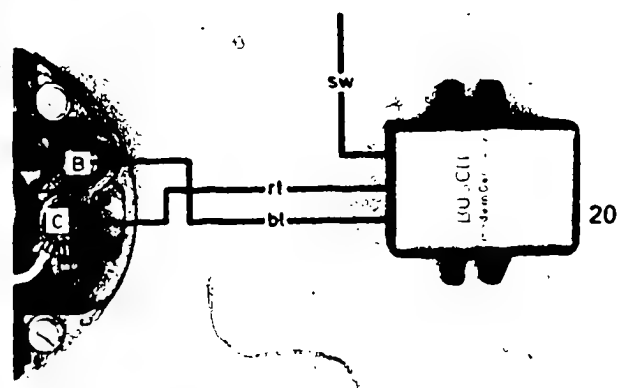
### 7.2 Mounting of the unit on the test bench or support

#### 19 Remove fan from flywheel for the test.

Before fastening the armature base plate, feed tester  
leads through the holes of the driving device, inter-  
mediate plate and armature base plate and connect to  
screw terminals as shown in Figs. 20 and 21.

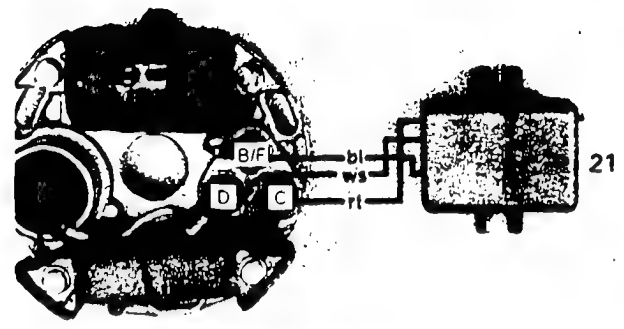
Insulate short-circuiting line.

Connection diagram for the KBK-type ignition unit.



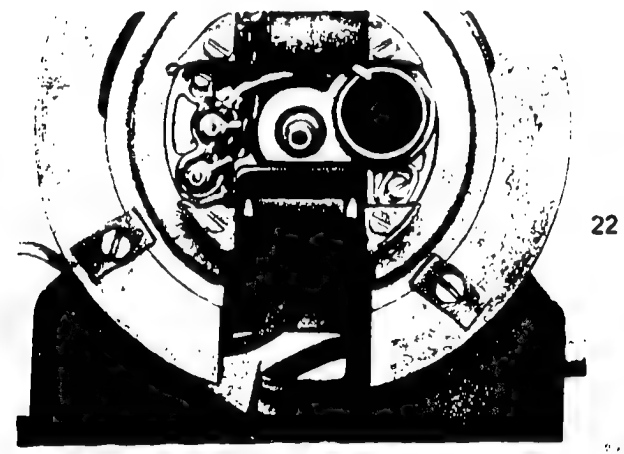
sw = black  
 rt = red  
 bl = blue

Connection diagram for RBK-type ignition unit.

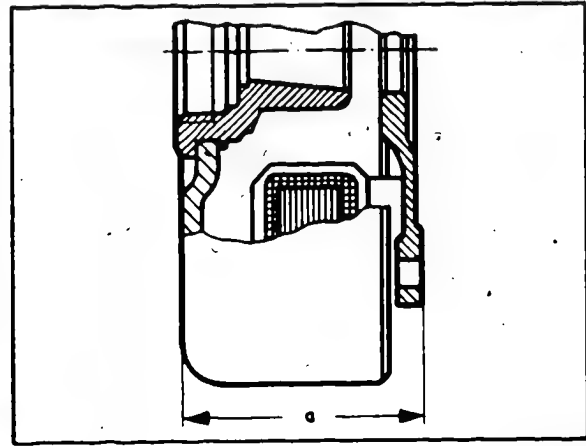


bl = blue  
 ws = white  
 rt = red

Place mounting device EFLM 4 A on generator test bench so that the ignition armature is at the bottom and the armature base plate mark is visible on the front. Install flywheel.



22



23

Setting dimension "a" for mounting on test bench.

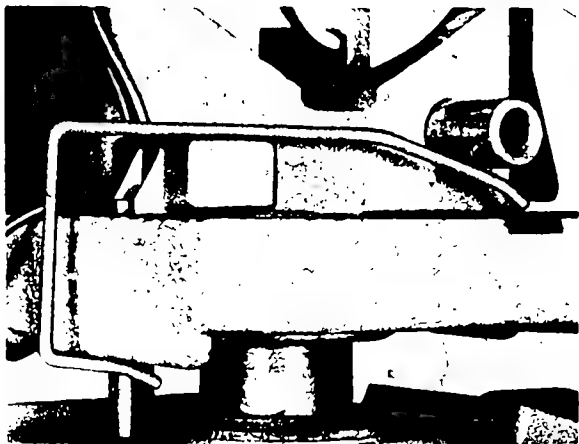
KBK	37.9 ± 0.6 mm
RBK	42 ± 0.8 mm

Align driving device with the test bench.

Check air gap

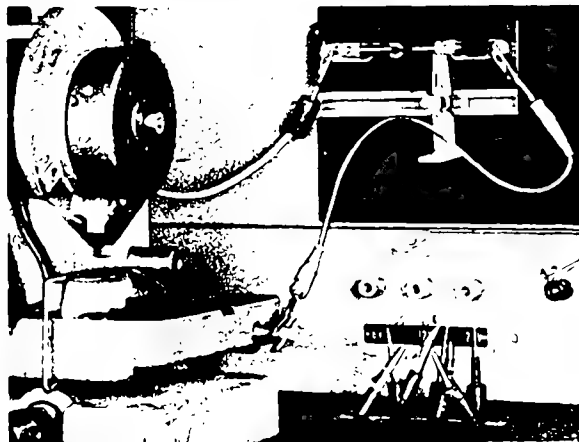
Nominal value 0.25 to 0.39 mm





24

Hold control unit in place with retaining clip (good ground connection).



25

### 7.3 Functional check of the installation

Connect spark gap on the test bench to the high-tension connection of the ignition armature.

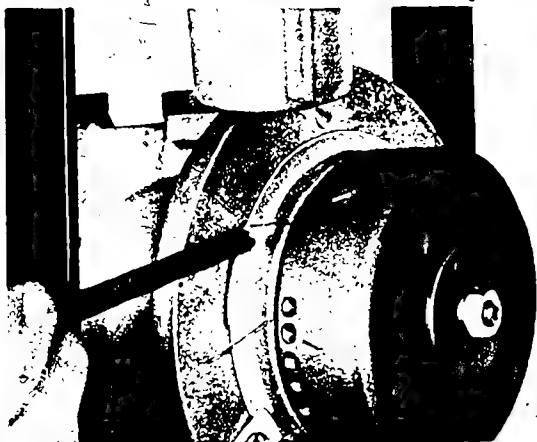
Switch generator test bench to the direction indicated on the flywheel and turn it on.

Speed 6,000 rev/min

Spark length 6 mm

Sparking must be continuous.

If no sparking occurs, check unit with ohmmeter (see Pars. 4.2 to 4.5).



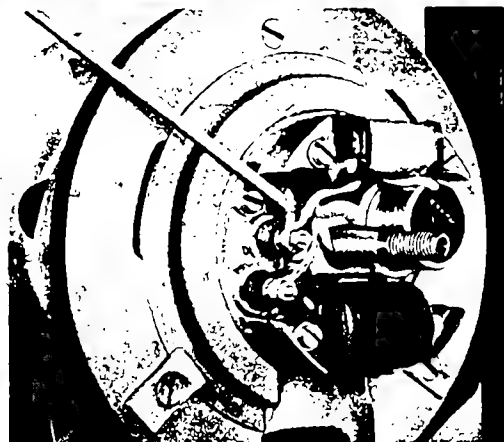
26

### 7.4 Marking of the point on armature base plate

If the ignition armature or the control unit were replaced, the old armature base plate mark should be removed.

Connect stroboscopic timing light.

Start test bench, flash the mark on the flywheel with the timing light and, at 6000 rev/min make a suitable mark on the intermediate plate. Turn off the test bench.



27

Remove flywheel, transfer mark on intermediate plate to armature base plate with straight-edge marker and punch at an easily visible place close to the periphery using a suitable tool.

See Par. 6 for ignition timing adjustment.

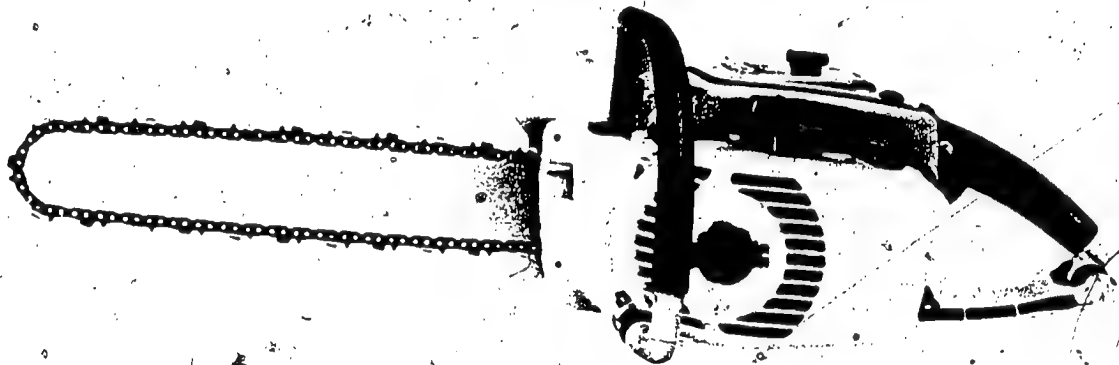
# BOSCH

VDT - WJE 114/1 B **MZ**  
Edition 10. 69  
Translation of German edition of 10. 68  
**REPAIR INSTRUCTIONS**

MCDI 0 227 300 001  
(High-voltage capacitor discharge ignition)

with

Magneto KBK 1 0 204 099 001  
used on Stihl chain saw



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ROBERT BOSCH GMBH STUTTGART GERMANY

### 1. Required test instruments and tools

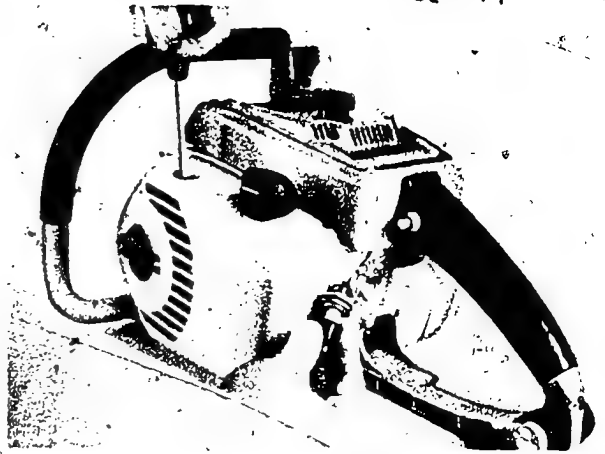
Generator test bench	EFLJ 20 ...	0 680 110 ...
or	EFLJ 25 ...	0 680 110 ...
Ignition stroboscope	all models except EFAW 169	
Ignition tester	EFAW 105 A	0 681 101 201
or	EFAW 105	0 681 169 029
Single test gap	EF 1177/7	1 684 531 000
Ohmmeter		commercially available
A.C. voltmeter	(e.g. multi-rmeter)	commercially available
Spot-check tachometer	(e.g. EF 3292)	1 687 233 005
Driving device	EFLM 4 A	0 681 221 002
Drive shaft	EFLM 29/2	1 685 722 005
Intermediate plate	EFLM 29/1	1 685 722 005
Extractor	EFLM 14	0 681 321 003

## 2. Trouble shooting prior to removal of the MCDI

### Checking the ignition spark (Figure 1)

Pull off spark plug connector, unscrew spark plug and attach ignition cable to spark plug. While cranking the engine with its starting mechanism, hold spark plug thread against housing and note spark.

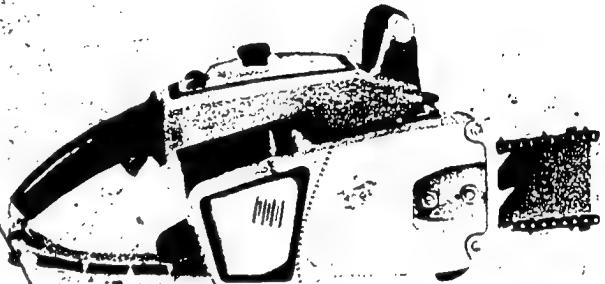
If despite a well cleaned spark plug with prescribed electrode gap there is no spark, the MCDI must be replaced.



## 3. Removing the MCDI (Figure 2)

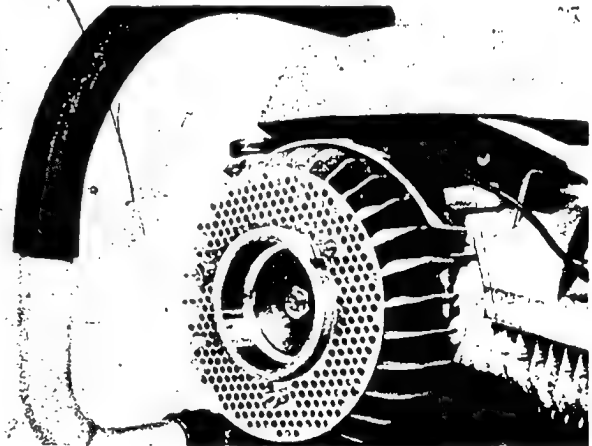
During removal, check all cables for breaks and damaged insulation.

Unscrew nuts on chain guard and remove the chain tensioning blade and chain.



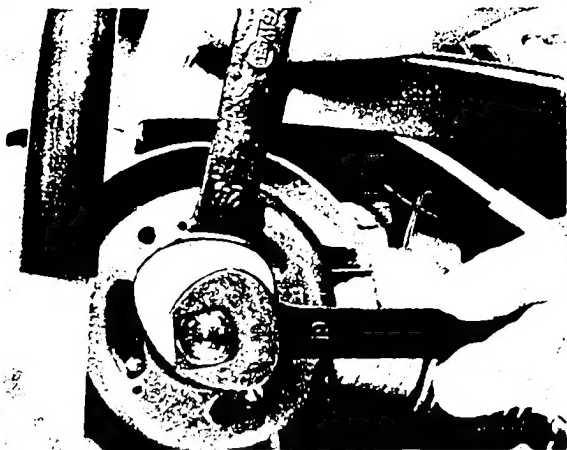
Unscrew fan housing and fuel tank (four M5 screws) and pull off the fuel hose from the tank. Remove tab terminal from short circuit switch.

Unscrew fan wheel screws and remove the fan wheel with perforated disc and gasket. (Figure 3)



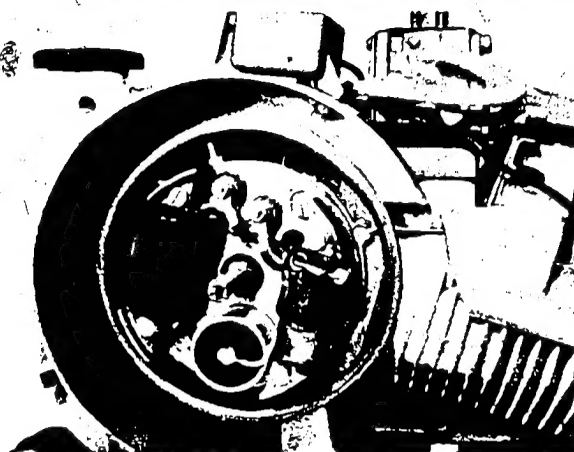
Unscrew crankshaft nut with Stihl combination wrench or suitable socket wrench. But first, unscrew the spark plug and, if available, screw in suitable length bolt to serve as a stop for the piston. (Figure 4)





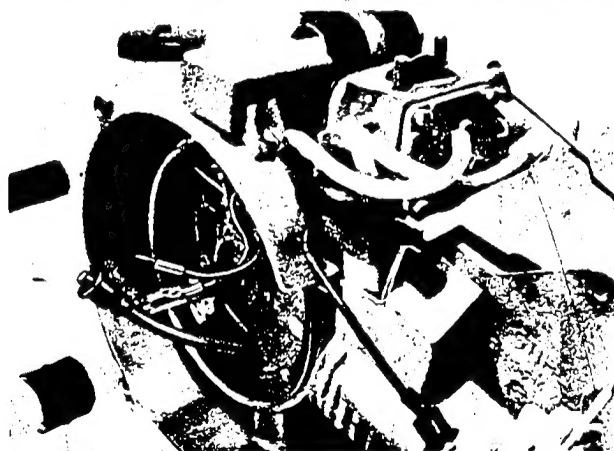
Pull off the magneto fly wheel with extractor EFLM 14 from the conus and inspect for good condition of the oxide magnets. (Figure 5)

5



Unscrew filter cover, take out air filter and unscrew filter housing. Disconnect accelerator linkage. Unscrew tubular handle and handle frame and swing these parts aside.

6



Detach control box connections on armature plate (cables marked red and blue). (Figure 6)

Release armature plate, unscrew ignition cable from armature and remove the armature plate.

Unscrew control box and pull cable through grommet in the crankcase. (Figure 7)

7

#### 4. Testing the ignition armature

Carry out visual check: (Figure 8)

The ignition armature jacket must not show any damage (e.g. cracks or holes).

#### Resistance measurement:

Disconnect primary cable of ignition armature from blue terminal screw. Measure resistance between primary cable and armature core.

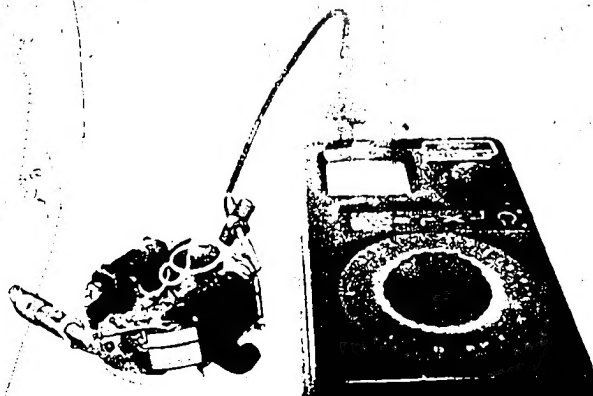
Nominal value 0.35 ... 0.7  $\Omega$ .

Measure resistance of secondary winding between high-voltage connection and armature core.

Nominal value 2200 ... 3700  $\Omega$ .

If the test values given cannot be obtained, the ignition armature must be replaced.

8



4

### 5. Testing on the test bench EFLJ 20.. or EFLJ 25..

Mount the armature plate and fly wheel onto the clamping and drive device EFLM 4 A. Use driveshaft EFLM 29/2 and intermediate plate EFLM 29/1. Before screwing the armature plate in position, pull the red and blue cables of the control box through the holes in the drive device, intermediate plate and armature plate, and connect to the terminal screws of the armature plate according to the colors. Connect the ignition cable prior to mounting. Do not squash control box cable nor run with a loop. Use a high-tension cable approx. 50 cm long for the ignition cable. (Figure 9)

9-

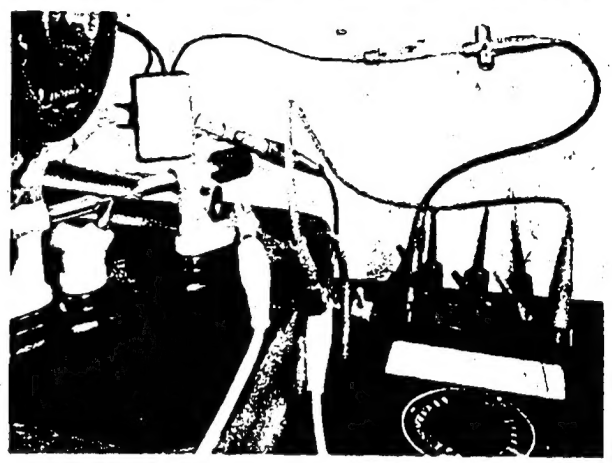


### Testing the charging armature and capacitor (Figure-10)

Load ignition armature with a single test gap EF 1177/7. Connect A.C. voltmeter (e.g. multimeter with 666  $\Omega/V$ ) between short circuiting line and ground using the 150 Volt or 300 Volt A.C. range accordingly. Provide good ground connections, especially the control box housing.

Speed (R.P.M)	500	6000
Charging voltage (V)	30 ... 40	145 ... 165
Spark length (mm)	3	6
Measuring range	150 V AC	300 V AC

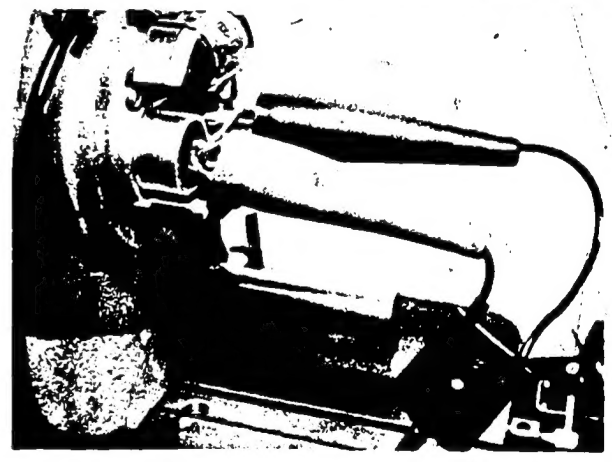
10



If the voltages stated cannot be obtained, the charging armature with charging diode and resistor must be replaced.

If the meter gives no reading, test the capacitor with the ignition tester EFAW 105. Unsolder the capacitor wire before measuring. Capacitance, approx. 0.0  $\mu$  F. Replace defective capacitor (complete with armature plate). (Figure 11)

11

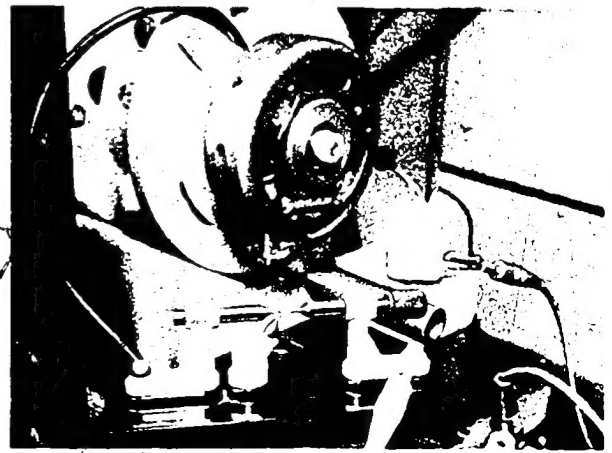


### Operational test of ignition armature (simultaneously serving as short-circuit test)

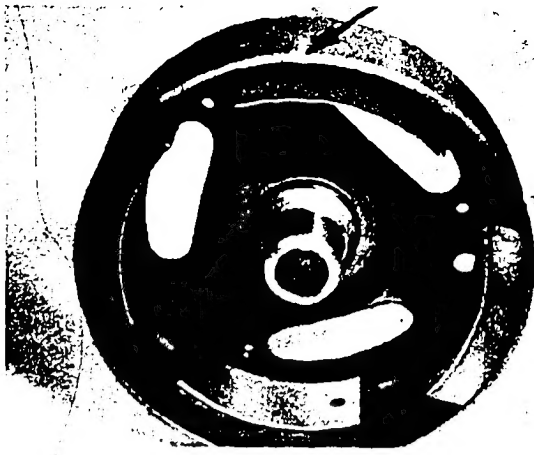
Load ignition armature with a single test gap (Figure 12)

Speed (R.P.M.)	500	6000
Spark length (mm)	3	6

12



Sparks must jump at regular intervals. If the values stated cannot be obtained, replace the control box by a new one first. If the new control box still fails to produce the required data, the ignition armature will have to be replaced.

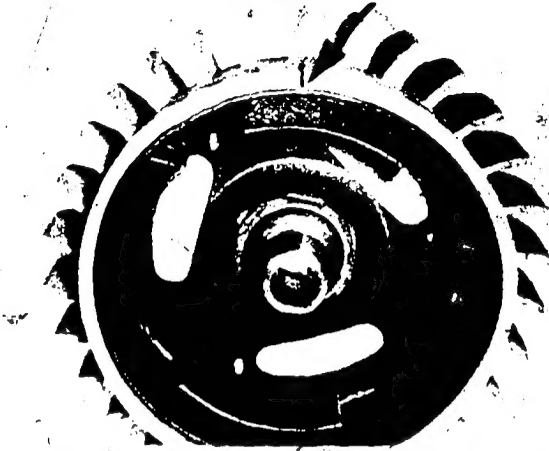


## 6. Installing the MCDI

Marking suggestions for ignition setting (Figure 13)

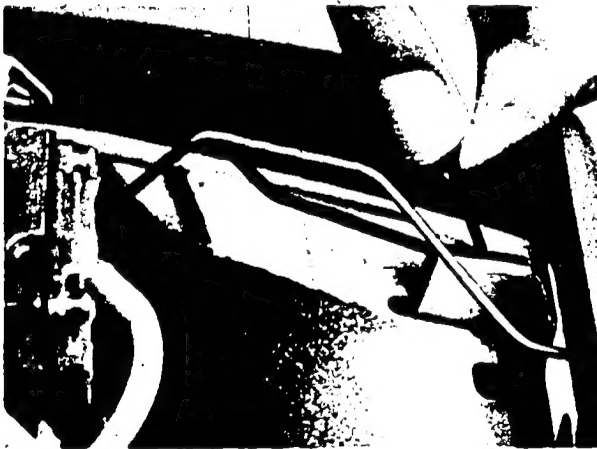
Extend the marking on the front face of the demounted pole fly. Screw the fly wheel, fan and perforated disc together and transfer the marking of the pole wheel face onto the fan using a scriber.

- 13 When installing a new fly wheel, correct the existing marking on the fan if necessary.



If an ignition armature, charging armature, control box or armature plate have been replaced, the marking on the armature plate relative to the marking on the crankcase may deviate after setting the ignition with a stroboscope (see section "Ignition timing adjustment"). If necessary, the original marking on the armature plate must be copied and a new marking should be transferred from the crankcase.

- 14 The marking on the crankcase always remains valid after any repairs on the electronic system. (Figure 14)



## Installing the individual components

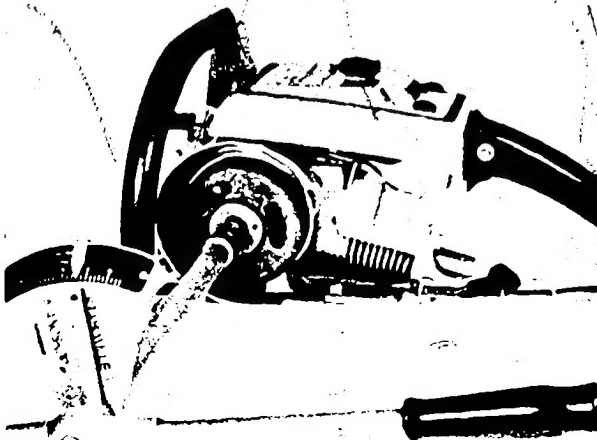
(Figure 15 and 16)

Screw control box onto the crankcase and pull the cable through to the armature plate. Connect ignition cable to the ignition coil and mount the armature plate. Connect control box cable to the terminal screw. Before mounting the pole wheel, make sure that no magnetic particles are adhering to the wheel. Mount the pole wheel and secure with the crankshaft nut (tightening torque 3 mkp (21.7 lb-ft). Connect the short-circuiting cable.

- 15 Screw on tubular handle and handle frame, engage accelerator linkage, place filter in position and screw on filter cover. Connect fuel hose to the tank and run without kinks. Secure fan cover for now with 2 screws only.

If a piston stop was installed, unscrew it and screw in the spark plug. Connect ignition stroboscope EFAW . . 99 B, . . 169 A, . . 180 or . . 185 (not EFAW 169) between spark plug and ignition cable.

Set throttle to "0" and short-circuiting switch to "1". Check all tab terminals for secure seating. Crank engine at half throttle setting. Carefully unscrew fan cover while the engine is idling and turn to the side.



16

6

**Ignition timing adjustment**

(Figure 17 and 18)

Three tasks must be carried out simultaneously:

- a) Hold saw securely and feed fuel
- b) Measure crankshaft speed
- c) Flash markings with stroboscopic light.

The markings on the fan and pole housing must coincide at 6000 R.P.M. crankshaft speed. Hold the spot-check tachometer against the crankshaft on the exhaust side. If the marking on the fan is displaced to the left (advanced ignition), the armature plate must then be turned to the right. With retarded ignition, turn armature plate to the left. To adjust the armature plate, the fan must be unscrewed.

17



The armature plate can be loosened through the pole wheel apertures and then be rotated. Reassemble the components, crank the engine and flash ignition markings again. Continue adjusting the armature plate until the ignition is correctly timed.

Tighten filter housing and tank securely and run fuel hose without kinks. Remove stroboscope. Attach spark plug connector to plug. If the engine runs perfectly after repeated starting, install the chain tensioner with chain and the chain guard.

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